Fig. 1. [illegible]

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sent new genus is considered to be the member of Thraustochytriaceae between Ectrogellaceae and Saprolegniaceae with the characteristics of eucarpic and scantily developing thallus. The Thraustochytriaceae has been known to include the only one genus *Thraustochytrium*, from which the present new genus can be separated by the following features.

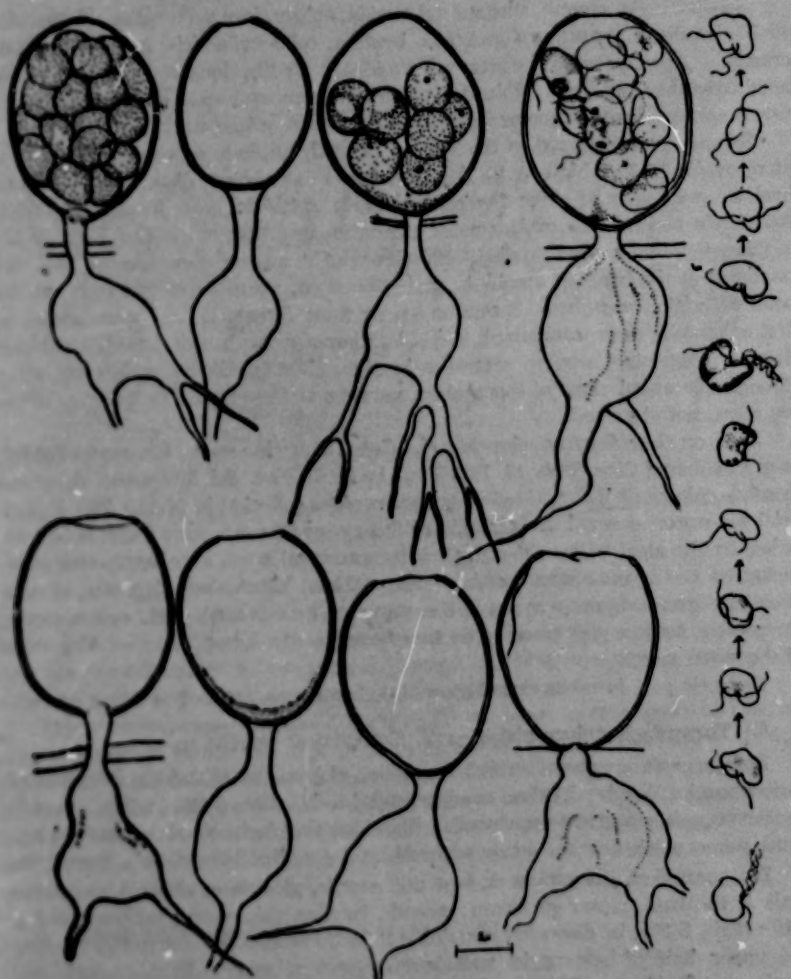

Fig. 5. *Japonochytrium marinum* Thalli with sporangia in various stages of development, and zoospores

Japonochytrium	*Thraustochytrium*
Sporangial wall opening by a pore	Sporangial wall bursting
Sporangium not proliferating	Sporangium proliferating
Zoospores liberate through pore one by one as flagellate bodies	Zoospores liberate at first as a cyst-like mass.

5. **Japonochytrium marinum** Y. Kobayasi et Ookubo sp. nov.

Zoosporangia sparsa, stipitata vel sessilia, sphaeroidea vel ovoidea, 16–30μ alta, 10–20μ in diam., crassiusculiparietalia, hyalina, collis cylindricis, 3–5μ longis, 3–4μ crassis. Apophyses vesiculares vel ovoideae, 10–13μ longae, 5–10μ in diam., tenuiparietales, hyalinae. Rhizoidea plerumque ramosa basi 3μ crassa. Zoosporae primo sphaeroideae, atque reniformes 4–5μ crassae, granulatae.

Sporangium scattered on the host-cell, shortly stipitate or sessile, sphaeroid or more ovoid, 16–30μ high by 10–20μ in diameter, somewhat thick-walled, smooth, hyaline, well defined from the stalk. Stalk cylindric 3–5μ long, 3–4μ thick. Apophysis vesicular or ovoid, smaller than the sporangium, 10–13μ long, 5–10μ in diameter, thin-walled, hyaline. Rhizoids usually arising from one or two axis produced at the base of apophysis, generally stout, up to 3μ in diameter at the point of origin, branched. Zoospores ten or more formed in one sporangium, at first sphaeroid, then reniformed, 4–5μ in diameter, with two laterally attached flagella, containing one to several refractive globules, slowly swimming away through the apical pore of sporangium, varying in form when swimming. Resting spore not observed.

Hab. on *Gracillaria confervoides* (L.) Grev. in marine water, Kanazawa-hakkei, near Yokohama City (Feb. 13, 1953-Type in Herb. Nat. Sci. Museum). After one month's culture of living *Gracillaria confervoides* collected in March 1953 in artificial sea-water, several zoosporangia of the present fungus were found to be scattering on the algal cells, although their intramatrical parts were hardly seen interrupted by the dense contents of host cells. Then, *Cladophora japonica*, a kind of marine green algae, was put in the same cultural vessel, and, consequently, the present fungus was found to be transferred to the latter algae in May 19th of the same year.

Epibiotic part is somewhat thick-walled, but seems not to be resting spore.

6. **Thraustochytrium globosum** Y. Kobayasi et Ookubo sp. nov.

Zoosporangia gregaria, epibiotica, sessilia, globosa vel ellipsoidea, interdum ad basin obconica, laevia, hyalina, tenuiparietalia, 5–10μ alta, 5–20μ in diam., cum 8–24–30 zoosporis, maturitate erumpentia. Rhizoidea singularia, simplicia tenuia. Zoosporae primo polyhedratae, deinde nephroideae 3–4×2.5μ, bilagellatae, granulatae.

Zoosporangium gregarious on host cell, sessile, globose or ellipsoid, sometimes conic at the base, never proliferate, smooth, hyaline, thin-walled, without papilla, 5–10μ high, 5–20μ in diameter, containing 8–24–30 zoospores, at maturity bursting and upper half of sporangial wall irregularly torn away. Rhizoid single and simple, not so long. Zoospores polyhedral in immature stage, then becoming nephroid, 3–4×2.5μ, with two oppositely directed lateral flagella, containing two or three granules.

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Hab. On some green algae of Ulothricales in marine water, Hutomi, Tiba Pref. (March 20, 1953-Type in Herb. Nat. Sci. Museum).

The monotypic genus *Thraustochytrium* has several characteristics which the proliferating zoosporangium bursts at maturity, distal portion of its wall torn away, and liberating a mass of immature zoospores which swim away separately after a dormant stage of several hours.

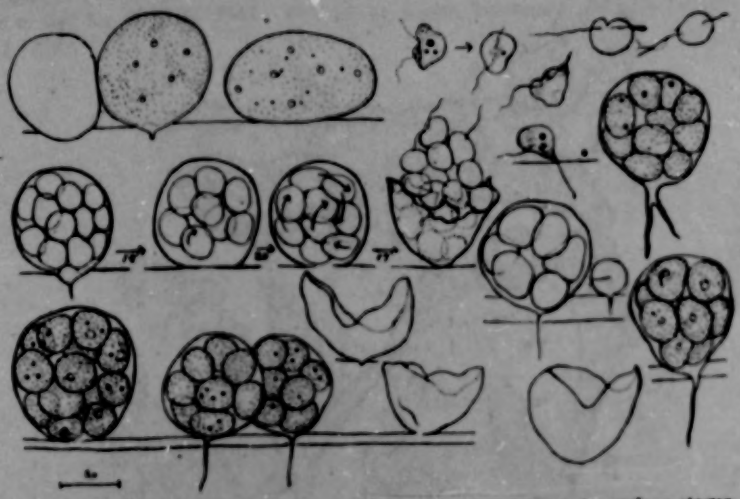

Fig. 6. *Thraustochytrium globosum* Thalli with sporangia in various stages of development, and zoospores

The zoosporangium of the present species does not proliferate and its zoospores complete their development in sporangium, swimming away immediately after bursting of sporangial wall. In spite of these differences, the writers presume to take the present species as the second member of Thraustochytrium, taking the bursting of sporangial wall as prime generic character.

The present fungus was found in June 6th on some green algae of Ulothricales collected in March and kept in artificial sea-water in our laboratory. It was found that some zoospores move and rotate slowly already in sporangium as shown in figures, and keep their vesicular mass one or two minutes after bursting and then swim away separately. After five hours of swimming, these zoospores settle on the neighbouring cell of algae and sprout to become new individuals.

7. **Sirolpidium Bryopsidis** (de Bruyne) Petersen

in Oversigt Kgl. Danske Vidensk. Selskabs. Forhandl. 1905 (5): 480 fig. 9 (1905); Sparrow, Aquatic Phycomycetes p. 644 fig. 60 (1943).

Syn. *Olpidium Bryopsidis* de Bruyne in Arch. de Biol. X: 85 pl. 5 figs. 1-15 (1890).

reniform, sphaerical or ellipsoid, smooth and thin-walled, hyaline, 20–40μ high by 15–30μ in diameter, laterally bearing a single or rarely two discharge tubes; tube 50–90μ long by 7.5–10μ in diameter, tip slightly extramatrical, tapering. Zoospores numerous, nephroid, biflagellate, matured in sporangium. Resting spore spherical, 27μ in diameter, somewhat thick-walled, with several refractive oil drops.

Hab. In *Cladophora japonica* in sea-water, Narawa, Tiba Pref. (Dec. 7, 1962).

The Japanese fungus was found in the middle of January in the living cells of *Cladophora japonica*, which was collected in December and maintained in the artificial sea-water in Petri dish.

9. **Myzocytium proliferum** Schenk

Ueber das Vorkommen contractiler Zellen im Pflanzenreiche p. 10 (1858); Zopf. in Nova Acta Acad. Leop. XLVII: 159 pl. 14 fig. 6–34 (1884); Martin in Mycologia XIX: 188 fig. 1 a, b (1927); Tokunaga, in Trans. Sapporo Nat. Hist. Soc. XIII: 228 fig. 2 (1934); Sparrow, Aquatic Phycomycetes p. 649 fig. 62 A-C (1943).

form. **marinum** Y. Kobayasi et Ookubo form. nov.

A type differt fungo marino.

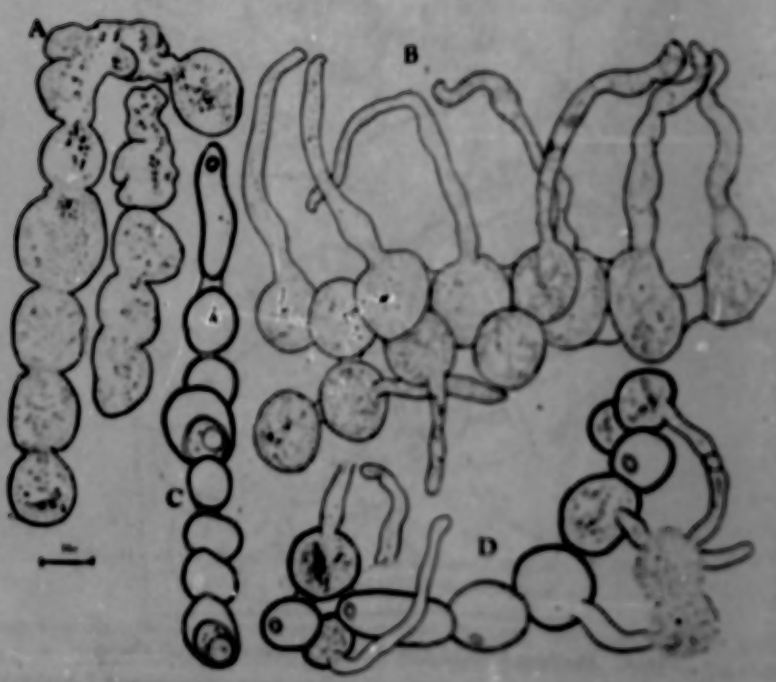

Fig. 8. *Myzocytium proliferum* f. *marinum*.
A. Young thallus B. Mature thallus C. Thallus with oospores
D. Thallus with zoosporangia and vesicles

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Thallus endobiotic, elongated, unbranched, forming monilioid chain, after maturity segmented in 3-6 or more zoosporangia and gametangia. Zoosporangia in headlike chains connected by thin outer membrane, globose, ellipsoid or more longer, 10-20μ in diameter, somewhat thick-walled, colourless, each with a lateral discharge tube; tubes protruding through the wall of host-cell, cylindric, contorted, 50-60μ long, attaining 280μ, 5-6μ in diameter. Zoospores forming a vesicle at the orifice of discharge tube, metphroid, 6×3μ, with lateral two flagella. Male and female gametangia commonly globose, intercalar. Oospore loosely and singly formed within female gametangium, globose or ellipsoid, commonly 15μ in diameter, smooth, thick-walled, containing an eccentric large oildrop.

Hab. Parasitic in *Cladophora japonica* Yam. in sea-water, Wada-ura, Tiba Pref. (March 19, 1953).

This is the first record in sea-water. In 7th April of the same year, the fungus was found in the cells of *Cladophora* cultured in artificial sea-water.

and seven trees (not included in the total) were so severely infected that they were felled. Many of the local infections in these trees were evidently established before the 1950–51 harvest but we are satisfied that most were a direct result of the harvest damage nine months before. Had the fungus been allowed to spread unchecked the history of this plantation would probably have repeated that of the one described above.

Possible control and remedial measures

Control measures should be based on reducing the quantity of inoculum and preventing the injuries which permit infection, combined with cutting out infected parts of trees in which the disease is not too far advanced.

One source of inoculum is the many dead trees, or dead branches on moribund trees, which occur in all areas. Plate 22, figs. 5 and 6, illustrate different stages of die-back in two plantations, both beyond remedial treatment. Unfortunately it has long been a deliberate policy to leave these dead trees standing to provide shade for young saplings. The first and most obvious control measure, therefore, is to remove and destroy dead material. We have found pycnospores being extruded from the trunks of trees which have been dead for at least 9 months.

A second source of inoculum is the lesions on the trunks and branches of still living but infected trees. This is probably the most important source. Not only does infection in the upper branches of a tree give rise to secondary infections lower down on the trunk, spores being transported by water, but insects, birds and, most important, human beings probably also act as carriers. The clothing and person of a clove picker cannot fail to be liberally contaminated with spores. Inoculum on trees still bearing can be removed by cutting infected branches and excavating trunk lesions by standard methods of tree surgery. This process is made very much simpler by the fact that infected parts are clearly demarcated by a characteristic stain. Saplings from which infected areas were cut out, and the wounds protected by paint, more than a year ago, have demonstrated the practicability of this treatment.

Experimental treatment on a plantation scale has been applied to the second estate mentioned on p. 605. All diseased wood was cut away and the wounds treated with white-lead paint. Local African agricultural workers took readily to this task after short training, and the ladders and other equipment provided proved unnecessary as these men are accustomed to climb clove trees. In no treated tree has the fungus continued to spread, although, in a block of untreated trees, the disease is making obvious progress.

Many of the trees which were treated experimentally were so severely infected that, in practice, it is doubtful whether the treatment would be economically justified. Experience has shown, however, that large lesions, necessitating the removal of more than half the trunk over a distance of several feet, can be excised without having any appreciable effect on the vigour of the tree. Clove wood is extremely hard and tough and it seems unlikely that such treated trees will be

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brought down by high winds. A concerted effort over a few years would probably reduce the incidence of *Cryptosporella* die-back greatly, and might almost eliminate it. Young and uninfected trees can certainly, with adequate attention, be protected. This can only be done if harvesting methods are modified; the present ones, if persisted in, are certain to bring the industry to a premature end.

It is a pleasure to acknowledge the encouragement and practical assistance given us by Sir Vincent Glenday, who, at the time when this work was being done, was British Resident in Zanzibar. Our thanks are also due to Mr E. W. Mason, of the Imperial Mycological Institute, who has helped us with the taxonomy of *C. eugeniae*.

APPENDIX

Diagnosis

Cryptosporella eugeniae Nutman & Roberts sp.nov.

Species in truncis ramisque parasitica, lignum ad corticem rufo-brunneum colorans. *Pycnidia* in parte inferiore peridermii efformata, brunnea, depresso-conica, ½–¾ mm. diam., per collum breve rumpentia, intus uni-locularia, subhyalina, strato prolifero labyrinthiformi vestita. *Sporophora* singula, ampulliformia hyalina, 8–12 μ longa, 2–3 μ lata. *Pycnosporae* ovoideae, continuae, hyalinae, 3·4–5 μ longae, 1·5 μ latae, in massa aurantiacae. *Perithecia* in primo singula, mox 2–10 vel pluria in pustulas sublineares aggregata, globosa, brunnea, 500–900 μ diam., in collum aequilongum vel longius producta, intus ascis farcta. *Asci* obclavati vel fusiformes, saepe in aequilaterales, sessiles, apice leniter applanati, basi rotundati, tenuiter tunicati, 8-spori. *Paraphyses* nullae. *Ascosporae* sub-distichae vel oblique monostichae, oblongae, utrinque rotundatae, hyalinae, saepe 2-guttulatae sed nunquam septatae, 7–8 μ longae, 3–4 μ latae. *Hab.* In cortice *Eugeniae aromaticae*; in Insula Zanzibar, Africae or.; per annum, 1951. (F. J. Nutman & F. M. Roberts); specimen ut 44954 in Herb. I.M.I. depositum, typus. 4. iv. 1952

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Basinym: *Brachysporium trifolii* Kauffman (1920). Saccardo, *Syll. Fung.*, 1931, **25**: 835; see also Mason, E. W., 1928, *Annotated Account of the Fungi Received at the Imperial Bureau of Mycology*, List II, Fascicle 1, p. 5.

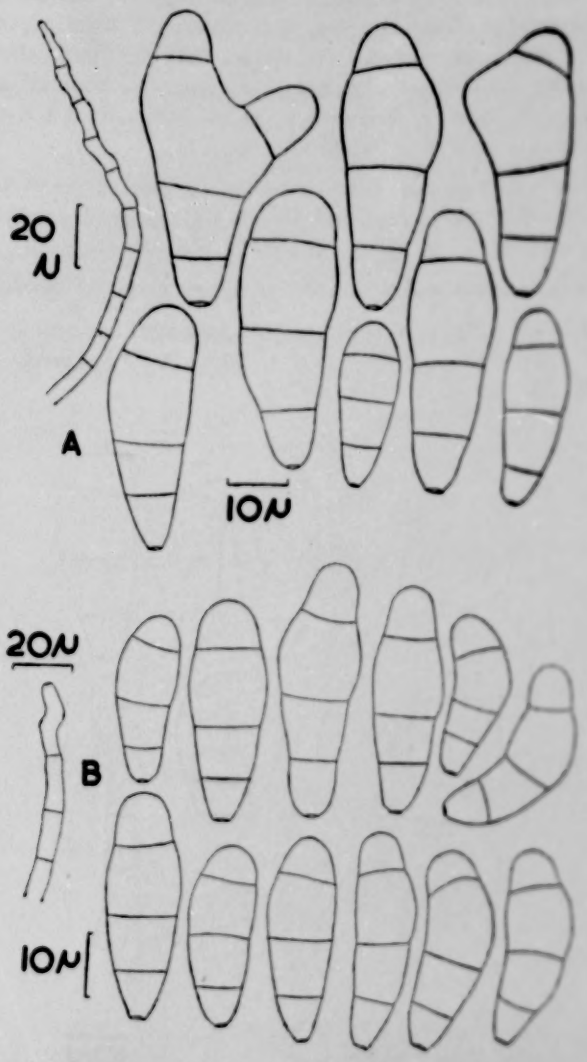

FIG. 6. *Curvularia indica* : A, from type specimen, Herb. M.U.B.I. No. 851-II; B, from Herb. M.U.B.I. No. 848-II.

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Conidiophores brown, simple, unbranched, septate, geniculate and paler at the tip, 3-3·4-4·8 μ in diameter, of variable length. Conidia brown, unequally ventricose-fusiform, curved or sometimes somewhat straight, 3-septate, not constricted at the septa, the third cell from the base larger, broader and darker than the others, the apical cell with a smoothly rounded tip, the basal cell crucible-shaped with a distinct scar at the base indicating the point of attachment to the conidiophore, (16·8-)17·6-(19·36-)11-18(-) μ.

Only one collection has been seen: on dead culms of *Scirpus* sp., Poonamallee (Chingleput District, Madras State), 16-2-1955, coll. C. V. S., Herb. M.U.B.L. No. 851-I.

The fungus collected by me comes nearest to *C. ovoidea*, as re-described by Groves and Skolko (1945, pp. 101-102, t. 1) after examining the type specimen. The measurements of the conidia of the type specimen as given by Groves and Skolko are: 25-35 (-38) × 10-12 μ, and the measurements of the conidia in my collection are similar. It is true that my fungus has a substratum different from that on which the species was originally described, but this is of not much importance in a genus like *Curvularia*, species of which have been reported on diverse substrata.

FIG. 1. *Curvularia inaequalis* (Shear) Boed. Conidia and conidiophores.

38. **Curvularia indica** Subramanian sp. nov.

Conidiophori simplices, brunnei, erecti, recti vel curvati, septati, 4-8-6-3 μ lati, longitudinis variabilis. Conidia spiraliter infixa apicibus conidiophorarum, ellipsoidea, ut plurimum recta, raro curvata, brunnea, 3-septata, leniter constricta ad septa, vel nullo modo constricta, cellula tertia supra basim ampliori et latiori cæteris, cellula apicali lævi, rotundata ad apicem, cellula basali catino simili, insignita cicatrice infra, 24-47×8-16 μ.

Habitat in culmis emortuis *Scirpi* sp., Poonamallee (Chingleput District, Madras), 24-2-1953, legit. C. V. S., Herb. M.U.B.L. Nos. 831-II (Typus), 848-II.

C. *indica* Subramanian sp. nov.

Conidiophores brown, simple, erect, straight or bent, septate, 4-8-6-3 μ broad, of variable length. Conidia borne in spirals towards tip of the conidiophore, ellipsoidal, mostly straight, seldom curved, brown, 3-septate, slightly constricted at the septa or not at all, the third cell from the base larger and broader than others, the apical cell with a smoothly rounded tip, the basal cell crucible-shaped with a scar at the base, 24-47×8-16 μ.

Habit.: on dead culms of *Scirpus* sp., Poonamallee (Chingleput District, Madras State), 24-2-1953, coll. C. V. S., Herb. M.U.B.L. Nos. 831-II (Type), 848-II.

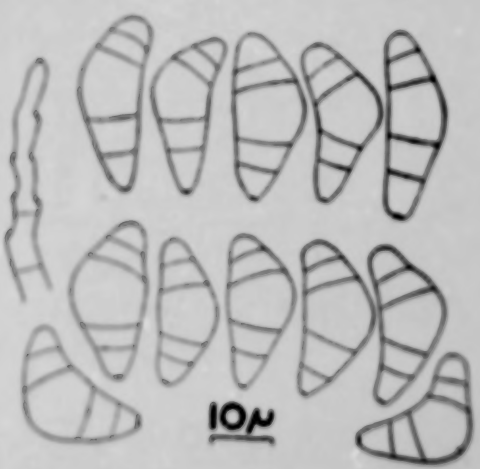

FIG. 8. *Curvularia fabiata* : from Herb. M.U.B.L. No. 91-III.

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The measurements of the conidia in the two collections are:

Herb. M.U.B.L. No. 851–II: 39×13·1 (25–47×9–16) μ;

" 848–II: 33×11·4 (24–40×8–13) μ.

My fungus has 3-septate spores and is easily placed in the Lunata group. Amongst the seven known species of this group, it comes nearest to *C. stapeliae* (du Plessis) Hughes and du Plessis (Hughes, 1951, p. 28), originally described from South Africa by du Plessis as *Tripospermum stapeliae* du Plessis. The measurements of conidia in *C. stapeliae* are given by Hughes (1951) as: 26–41×10–15 μ. The size of the conidia of my fungus falls largely within the range covered by *C. stapeliae*, despite the fact that a few conidia were longer (up to 47 μ). The conidia of my fungus, however, differ from those of *C. stapeliae* in the following features: (i) the conidia are not conspicuously curved as in *C. stapeliae*, but the majority of them are straight; (ii) in the case of conidia of *C. stapeliae* the third cell from the base alone is the darkest, but in my fungus the two middle cells are concolorous with each other and are darker than the apical and the basal cells.

On the basis of these differences, my fungus has been described as a new species.

FIG. 9. *Curvularia uncinata* : from Herb. M.U.B.L. No. 848–I.

PART I

General List of Species

1. *Armillaria robusta* (Fr.) Kummer

Pileus 4–10 cm. broad, convex with an inrolled margin, expanding to plane or broadly umbonate, surface dry and appressed-fibrillose (matted down), fibrils soon breaking up into scales or separating to I-cm streaks, "Sayal brown" to "snuff brown" at first, gradually becoming darker, in age deep reddish brown, margin appendiculate with cottony veil remnants; flesh white, thick, hard, tending to stain orange brown where bruised, taste rancid-farinaceous, odor farinaceous and often strong; lamellae close, broad, adnexed, "tilleul buff" with a tendency to become vinaceous brown where bruised, edges eroded; stipe 6–9 cm. long, 1–2 cm. thick, usually narrowed below, solid, hard, white within but soon orange brown around wormholes, with a superior annulus which terminates a sheath, the sheath becoming broken into zones or patches of orange-brown fibrils or tissue, pallid and silky to squamulose above, base often "orange cinnamon."

Spores 5–6 × 4.5 μ, white in deposit, hyaline in KOH, pallid yellow in Melzer's solution, smooth, broadly ellipsoid; basidia four-spored, 28–34 × 6–7 μ; no pleurocystidia or cheilocystidia seen; gill trama parallel or nearly so, central stratum with cells broader than lateral strata; pileus trama homogeneous beneath a nongelatinous cuticle of narrow interwoven orange-brown hyphae; no clamp connections seen.

Habit, habitat, and distribution.—Gregarious under pine, spruce, fir, and aspen at the edge of a bog, Tahquamenon Falls State Park, Sept. 19, 1949, Smith 33969, and Sept. 13, 1951, Smith 38775.

Observations.—The mature fruiting bodies are deep red brown, and the surface of the pileus is dry at all stages. I have used the concept of Kauffman (1923), which is clearly in line with the Friesian descriptions. *Armillaria Zelleri*, a viscid species, has been reported under the name *A. robusta*.

2. **Cantharellus** cinereus Fries f. **multiplex**, f. nov.

(Pl. I)

Dense caespitosus; sporae 8–11 × 5–6 μ; stipes ramosus. Specimen typicum, in Herb. Univ. Mich. conservatum, legit prope Burt Lake, Mich., Aug. 8, 1951, A. H. Smith n. 37531.

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Fructification compound, 6–10 cm. broad and 8–12 cm. high; pileus 1–4 cm. broad, centrally to laterally stipitate (often merely eccentric), more or less funnel-shaped and deeply perforated, glabrous or nearly so and faintly zoned, becoming uneven to somewhat squamulose, the margin pallid and often crenate, central part smoky fuscous to "mummy brown"; flesh thin, concolorous with surface, taste slightly disagreeable, odor faint and not distinctive; lamellae decurrent, veinlike but very distinct and well formed, close to subdistant, deep cinereous becoming paler bluish gray; stipe compound and much branched, hence variable, surface smooth, hollow and darker within.

Spore deposit white, spores 8–11 × 5–6 μ, smooth, hyaline in KOH, hyaline to yellowish in Melzer's solution; basidia 4-, 6-, or 8-spored, 40–69 × 8–9 μ; no pleurocystidia or cheilocystidia seen; gill trama loosely interwoven, the hyphae not or only slightly differentiated; pileus trama homogeneous, pale brown in KOH; clamp connections not found.

Habit, habitat, and distribution.—On the ground in mixed woods, along with each group of clusters or single cluster there usually occurred a few carpophores gregariously, Colonial Point, Burt Lake, July 6, 1951, Smith 36695, Aug. 8, Smith 37531.

Observations.—The massive fructifications remind one of those of *Cantharellus multiplex*, but the latter is readily distinguished by its small rough spores and the reaction of the flesh (greenish) in KOH. In all respects the Michigan material fits well the concept of *C. cinereus* with the exception of the habit, and that difference could be the result of vigorous mycelium growing during an exceptionally favorable season. Since f. *cinereus* nearly always occurred in the vicinity of f. *multiplex*, the impression one gets is definitely that the latter is merely a growth form, but it should be put on record because it could easily be mistaken for *C. multiplex* in the field. For a detailed study of *C. multiplex* see Smith and Morse (1947).

3. *Cantharellus lutescens* Fries

(Pl. II)

Pileus (1) 2–4 (8) cm. broad, broadly convex to nearly plane at first, margin curved in, sometimes disc sharply depressed at first, expanding to shallowly funnel-shaped and the margin becoming wavy and irregular, disc often perforated (especially in age), in large caps the perforation broad and extending into the hollow of the stipe,

spotlike scales or minute squamules, color at first dingy orange brown, darker and dull leather-red to bay brown in age, buttons dingy ochraceous-orange buff; flesh concolorous with surface and changing like it, odor and taste not distinctive or slightly farinaceous; lamellae close, narrow, decurrent, dingy pinkish cinnamon at first but gradually darkening to a more vinaceous cinnamon (concolorous with cap margin); stipe short, 1–4 cm. long, 6–12 mm. thick, usually enlarged downward, becoming hollow, surface faintly fibrillose to unpolished, in age nearly hoary, nearly concolorous with pileus (pale when young, dark in age), with copious mycelium intergrown with needles at base.

Spores 5–5.5 × 3.5 μ, oval, smooth, hyaline to yellowish in Melzer's solution; basidia four-spored, 28–34 × 5–6 μ; no pleurocystidia or cheilocystidia seen; gill trama somewhat interwoven, hyaline in KOH, subhymenium thin and more or less cellular; pileus trama loosely interwoven and homogeneous beneath a more compact pellicular layer of slightly narrower cells, pigment mostly intracellular and soluble in KOH; clamp connections present.

Habit, habitat, and distribution.—Gregarious on sandy soil under spruce, Wilderness State Park, near tip of Waugoshance Point, Sept. 7, 1950, Smith 35911, same date, Harry Thiers (Smith 35959), same place, September, 1951, Smith 38533.

Observations.—Apparently this is the first record of this species from the state. Since Kauffman's original description was sketchy, a detailed account is included here. It is a most striking species, with the rivulose pilei and dark colors when mature. The mild odor and taste and darkening colors along with the smooth spores are diagnostic.

6. *Cortinarius elatior* Fries

This is one of the common species of the Pacific Northwest. On all the collections cited here as well as on my western collections (Smith, 1939) clamp connections are consistently absent. The same condition was found on a specimen from Sweden communicated by Lundell, and is true for Kauffman's collections. Thus it would appear that the character is a valuable one. It is easily demonstrated on the gelatinous hyphae of the pellicle. In most species of Myxacium these narrow gelatinous hyphae regularly have clamp connections at the cross walls. However, *Cortinarius elatior* is not the only Myxacium that lacks clamp connections. They are lack-

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ing in *C. collinitus* var. *olympianus* Smith (1944), also. Since all other forms and varieties of *C. collinitus* which I have studied have them, it is logical to place var. *olympianus* beside *C. elatior*, where it would rank as an autonomous species by virtue of its lack of cheilocystidia. In addition to this, I have discovered still other variants in the *elatior* group which lack clamps, but a number of details need further study before a critical account of the whole group can be published.

Material reported from Michigan.—Under conifers, Rees's Bog, north shore of Burt Lake, Cheboygan County, Sept. 18, 1949, Smith 33945; Tahquamenon Falls State Park, Sept. 9, 1951, Smith 38628, 38633, 38637; in a bog, east of Burt Lake, Sept. 11, 1951, Smith 38699, 38700.

7. **Hygrophorus laetus** Fr. f. **pallidus**, f. nov.

Pileus albidus; lamellae pallidae, decurrentes, distantes; stipes glutinosus, pallidus. Specimen typicum, in Herb. Univ. Mich. conservatum, A. H. Smith n. 37616, legit prope Pellston, Mich., Aug. 11, 1951 (Harry Thiers).

The microscopic characters all checked with those of forma *laetus*, and the typical disagreeable odor was also present. Young stages were found, and the pallid pileus gills and stipe were characteristic, so that there is no possibility of the carpophores being merely faded fruiting bodies.

8. **Hygrophorus marginatus** var. **concolor**, var. nov.

Pileus concolor cum lamellis. Specimen typicum, in Herb. Univ. Mich. conservatum, legit prope Tahquamenon Falls State Park, Sept. 5, 1949, Smith n. 33324.

Pileus 1–3 cm. broad, conic to obtusely conic, becoming conic-campanulate, surface glabrous, moist and hygrophanous, color "deep chrome" overall, or in some the disc "orange" in buttons, in age "Mars yellow" (brilliant orange yellow), margin finally spreading, thin and striatulate, fading finally to near "apricot-yellow" overall; flesh thin, brittle, concolorous with surface, odor and taste not distinctive; lamellae broad, subdistant, broadly adnate, "capucine yellow" to "deep chrome" (not brighter than pileus); stipe 3–6 cm. long, 4–8 mm. thick, equal or narrowed below, naked and glabrous, moist, "primuline yellow" (clear bright yellow).

Spores 7–9 × 4–5 μ, ellipsoid, smooth; basidia 36–44 × 7–9 μ,

four-spored; no pleurocystidia or cheilocystidia seen; gill trama of short-ellipsoid cells more or less parallel in central strand but flanked by interwoven tissue (subhymenium) on either side; pileus trama with a rudimentary gelatinous pellicle, tissue of flesh floccose and interwoven; no clamp connections seen.

Habit, habitat, and distribution.—Scattered under hemlock, Taquamenon Falls State Park, Sept. 5, 1949, Smith 33324 TYPE; same locality, Aug. 6 and Aug. 28, 1951, Smith 37514, 38356.

Observations.—This variety has been somewhat of a puzzle, but collections over a three-year period and comparisons with typical material have shown it to be constant and distinct. In var. *marginatus* the gills are "cadmium orange."

I cannot agree with Singer (1951) in placing this species in Tricholoma or with his statement that "its chemical characters are definitely in favor of insertion in the genus *Tricholoma* rather than *Hygrophorus* (or rather *Hygrocybe*), where it has been placed by Peck and others merely on the basis of the bright colored pigment reminiscent of some *Hygrocybe*, nor does it exactly match any of the colors occurring in that genus." When Singer (1943) made the transfer, he gave as the principal reason the lack of clamp connections in the fruiting body. In my estimation his statement, quoted above, represents his opinion rather than a fact established by adequate research. At least I do not know of sufficient research on the chemical composition of the pigment of the species in question as compared with that on the composition of the pigments of Hygrocybe and Tricholoma generally, to establish it. My own opinion, as one who has seen this fungus and its variations and who has studied them about as much as anyone else, is that its characters, with the exception of the lack of clamp connections, are in line with those of the subgenus Hygrocybe of Hygrophorus. When one considers the three varieties, *marginatus*, *olivaceus*, and *concolor*, it appears obvious that the pigments match those found in Hygrocybe rather than those in Tricholoma. It must always be kept in mind that each species in Hygrocybe has its own peculiar pigment pattern, which is important in the recognition of species. But this was not what Singer referred to when he stated that the pigments do not "match any of the colors occurring in that genus" (Hygrocybe). My own acquaintance with the group forces me to a conclusion just the opposite of Singer's.

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Singer recorded an interesting character of *Hygrophorus marginatus* when he pointed out that the species lacked clamp connections. I cannot, however, accept this as sufficient reason for the transfer. As more studies are made on agarics, it is found that in genera characterized by clamp connections at least one or two species turn up which do not have them. I have called attention to this in the present paper for both Cortinarius and Phaeocollybia, and Smith and Morse (1947) commented on it in the *Cantharellus clavatus* stirps. The situation as found in Hygrophorus appears to be a simple parallel to that occurring in these genera. Finally, although I have studied Tricholoma rather extensively in North America, I know of no species with which *H. marginatus* appears to be closely related, whereas in Hygrocybe there are several rather good possibilities, such as *H. coccineus* or *H. amoenus*.

9. *Lactarius Allardii* Coker

Pileus 6–15 cm. broad, convex-depressed, with an incurved margin, broadly vase-shaped in age, often cracked open in the depression, glabrous but with an unpolished to velvety appearance at first, in age at times variously rimose, color dead white at first but soon changing to vinaceous fawn or finally pale brick-red in the depression or more or less overall (changing color first where exposed to light); flesh white, thick, firm, odor faintly pungent, taste acrid and disagreeable (quickly acrid in young caps); lamellae close, narrow, some forked, decurrent, creamy white discoloring to brownish, greenish and then dingy brown where wounded; stipe 1–2 cm. long, 1–3 cm. thick, short, hollow, white and unpolished, becoming colored like the cap overall or in definite areas.

Spores white in deposit, 8–10 × 6–7 μ, broadly ellipsoid, covered with fine dark-violet particles (as warts) as seen in Melzer's solution, the particles separate or connected in groups of a few with fine violet lines (not a complete reticulum); basidia four-spored; pleurocystidia abundant, 50–70 × 9–12 μ, narrowly clavate with short-pointed apices varying to fusoid, often filled with globular (oily) content, tips usually projecting, many filamentous embedded cystidia also present and most with similar content; cheilocystidia similar to pleurocystidia but smaller and at times rare; cuticle of pileus an ochraceous to pallid zone of interwoven narrow hyphae from which arises a dense turf of hyaline narrow (4–6 μ) thick-walled elements

interwoven, composed of narrow often-branched crooked hyphae with thickened walls, hyaline in KOH and pale yellow in Melzer's solution, a narrow zone of subparallel hyphae flanking the interwoven midsection on each side, basidia arising from hyphae that diverge from outer surface of subparallel zone, no clamp connections seen; pileus trama homogeneous, the hyphae similar to those of central section of gill trama, cuticle differentiated by the hyphae being of slightly larger diameter, having thicker walls, and with colored content when fresh, terminal ends of hyphae often cystidium-like, i.e., clavate to subfusoid and with very thick walls, no clamp connections seen.

Habit, habitat, and distribution.—On dry, decorticated wood, such as aspen logs in exposed places and old fence rails, spring and summer. Clover and Smith collected it at Groupshaven near Lupton, May 17, 1948, Smith 28694, and it was found again in the same locality, May 30, 1951, by Mrs. Lydia K. Frehse, Smith 36334. Paul Harding collected it on cedar(?) fence posts near Umadilla, May 27, 1951, Smith 36317.

Observations.—Murrill (1915) reported it from New York to Indiana and west to Colorado and Montana, and Kauffman (1918) included it in his key but did not report it for the state. No collections by him have been located in the University of Michigan Herbarium. The fungus is very characteristic and can readily be identified in the field by the color of the pileus, which resembles that of *Tricholoma vaccinum*, and by the fact that nearly always the stipes are flattened at the base as a result of the fruiting body originating in a narrow crack in the woody substratum. The large cystidia and yellow reaction of the trama and spores in Melzer's solution are distinctive microscopic characters. Singer (1951) distinguishes between *Lentinus fulvidus* and *L. sulcatus* by the presence of metuloids (pleurocystidia) in the former and their absence in the latter. On this basis, the collections reported here would be *L. fulvidus*. Murrill (1915) considered *L. fulvidus* to be a synonym of *L. sulcatus* and ascribed fusoid cystidia to it.

12. **Mycena alcalina** f. **alba**, f. nov.

Pileus 1–2 cm. latus, obtusus, glaber, albidus demum pallidus; lamellae albidae; stipes albidus.—Specimen typicum, in Herb. Univ.

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Mich. conservatum, legerunt prope Higgins Lake, Mich., May 17, 1945, A. McCrea et B. B. Kanouse.

Pileus 1–2 cm. broad, obtuse, more or less expanding, surface moist, white, hygrophanous, dead white when faded; flesh thin, white, odor sharp (alkaline); lamellae close, white, ascending-adnate, broad; stipe 2–4 cm. long, 1–2.5 mm. thick, equal, pruinose above, white, glabrous.

Spores ellipsoid, 8–10 (11) × 4.5–6 μ, smooth, bluish in Melzer's solution; basidia 20–26 × 7–8 μ, four-spored; pleurocystidia scattered, (38) 50–70 (80) × 9–14 μ, fusoid-ventricose to subcylindric, the apices rounded to subacute, simple or forked, neck elongating greatly in age and then somewhat irregular in outline; cheilocystidia 28–42 × 9–15 μ, variable, similar to pleurocystidia or subclavate with several to many contorted protuberances projecting from the enlarged portion; gill trama vinaceous in Melzer's solution, of enlarged hyphae with subparallel arrangement; pileus trama with a rudimentary pellicle of hyphae covered by minute rodlike projections or these projections arising from the exposed surfaces of the hypodermal cells, hypoderm distinct, trama, including hypoderm, vinaceous in Melzer's solution.

Habit, habitat, and distribution.—Scattered on a conifer log, Higgins Lake, May 17, 1945, A. McCrea and B. B. Kanouse (TYPE).

Observations.—The cheilocystidia aid in distinguishing this form from *Mycena nivicipes*. In addition, the latter occurs on hardwood. The white form of *M. alcalina* was found regularly for several seasons on a log beside Dr. McCrea's cottage, and was constant in the characters as described. In view of this it cannot be interpreted as a chance seasonal variation.

13. **Mycena fibula** f. **alba**, f. nov.

Pileus, lamellae, et stipes lacteus. Specimen typicum, in Herb. Univ. Mich. conservatum, legit prope Cross Village, Mich., July 21, 1947, Smith n. 25859.

Pileus 1.5–3 mm. broad, obtusely conic to convex, becoming somewhat campanulate or flaring on the margin, surface moist and hygrophanous, milk-white fading to a dead white and eventually discoloring to yellowish, surface at first minutely hispid (under a lens) from numerous pilocystidia, only very faintly striatulate

when moist; flesh thin, fragile, no odor or taste; lamellae broad, arcuate to decurrent, subdistant to distant, white, unchanging, very finely pruinose under a lens; stipe 10–15 mm. long, 0.25–0.5 mm. in diam., equal, fragile, concolorous with pileus and gills, unchanging when bruised, surface evenly and finely pubescent overall (under a lens), base faintly fibrillose.

Spores 4.5–5.5 (6) × 2.8–3.2 μ, smooth, oblong or nearly so, hyaline, thin-walled when fresh, but as revived after drying having a thickened wall, nonamyloid; basidia four-spored, 18–24 × 4–5 μ; pleurocystidia scattered, 60–80 × 9–14 μ, ventricose with long neck and subcapitate apex or apex not enlarged, thin-walled or, as revived in Melzer's solution, with a slight thickening in the apex, hyaline; cheilocystidia rare to scattered, similar to pleurocystidia; gill trama interwoven, nonamyloid; pileus trama nonamyloid, homogeneous (evenly cellular in tangential sections), with numerous pilocystidia similar to pleurocystidia arising from among the surface hyphae, clamp connections present but difficult to demonstrate.

Habit, habitat, and distribution.—Gregarious on a mossy bank in a hardwood forest, Cross Village, July 21, 1947, Smith 25859.

Observations.—In aspect this form does not suggest *Mycena* [illegible]*a* f. *fibula*, but the spores as well as the cystidia of gills, pileus, and stipe are identical or at most merely vary slightly in size. Consequently it seems best to refer it to *M. fibula* as a form with a typical Mycena-like pileus and lack of pigment. With this form in mind the transition from the Mycena type of pileus to the Omphalina type is readily understood.

14. **Mycena Leaiana** f. **pallida**, f. nov.

Pileus 1–3 cm. latus, pallidus, viscidus; lamellae obscure luteo-marginatae; stipes viscidus, pallidus vel subluteus. Specimen typicum, in Herb. Univ. Mich. conservatum, legit prope Proud Lake, Oakland Co., June 4, 1951, Smith n. 36340.

Pileus 1–3 cm. broad, obtuse to broadly convex, expanding to nearly plane, surface glabrous, viscid, faintly striate, color gray to pallid or brownish in age or then with dingy reddish-brown areas, drying pallid to gray; lamellae broad, close to subdistant, broadly adnate, pallid to dingy cream color but edges dingy yellow; stipe 3–7 cm. long, 2–3.5 mm. thick, equal, viscid, glabrous, pallid to dingy yellowish, often drying grayish at base.

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Spores 8–10 × 5–5.5 μ, blue in iodine (amyloid), smooth, elliptic in face view, many slightly bean-shaped in side view; basidia four-spored, 20–24 × 7–9 μ; pleurocystidia 34–48 × 9–12 μ, fusoid-ventricose to mucronate, smooth, pale yellow in H_2O when fresh, hyaline or nearly so when revived in KOH; cheilocystidia similar to pleurocystidia or generally less ventricose, with yellow content at first; gill trama orange brown in Melzer's solution except for the conspicuously gelatinous subhymenium of interwoven narrow hyphae; pileus trama with a thick gelatinous pellicle, tissue beneath orange brown in Melzer's solution, hypoderm poorly differentiated; clamp connections present.

Habit, habitat, and distribution.—Cespitose on beech logs, Proud Lake Recreation Area, Oakland County, June 4, 1951, Smith 36340 TYPE.

Observations.—This form was found growing in association with f. *Leaiana* on a windfall of several trees. It was clearly a form with very little pigment, rather than faded clusters of otherwise typical material. Both were in fresh, rapidly growing condition, and all stages of development from buttons to old caps were present in both, so that they could be compared. The existence of such a form as this is especially interesting in view of the discussion given under *Mycena mackinawensis*.

15. **Mycena mackinawensis**, sp. nov.

Pileus 10–20 (25) mm. latus, convexus vel subdepressus, glaber, udus demum viscidus, pelliculosus, fuligineus; lamellae pallidae vel cinereae, breviter decurrentes, subdistantes; stipes 1–2.5 cm. longus, 1–2 mm. crassus, viscidus, sursum pallidus, deorsum fuligineus; sporae 8–10 (11) × 5–5.5 μ vel 7–9 × 3.5–4 μ; pleurocystidia 30–45 × 8–13 μ, fusoideo-ventricosa; cheilocystidia filamentosa vel clavata et verrucosa. Specimen typicum, in Herb. Univ. Mich. conservatum, prope University Biological Station, Douglas Lake, Mich., June 30, 1947, Smith n. 25346.

Pileus 10–20 (25) mm. broad, when young convex to flattened, nearly plane or with an abruptly decurved margin at times and sometimes with a depressed disc, surface moist at first but soon viscid to the touch, pellicle thick and separable, color near "drab gray" when young, at maturity "grayish olive" on disc and with a paler margin, strongly translucent-striate to disc when moist, staining

reddish in age; flesh thin, pliant, no distinctive odor, taste not recorded; lamellae whitish when young, then gray but paler than pileus, arcuate, becoming short-decurrent, subdistant, only moderately broad, edges even; stipe 1–2.5 cm. long, 1–2 mm. thick, equal, nearly concolorous with pileus or paler above and concolorous below, pruinose, viscid; sparsely white-strigose at base.

Spores 8–10 (11) × 5–5.5 μ when revived in KOH, 7–9 × 3.5–4 μ in fresh material, when fresh pale blue in Melzer's solution, darker blue when revived in herbarium after drying, smooth, subellipsoid; basidia both two- and four-spored; pleurocystidia rare to scattered, 30–45 × 8–13 μ, essentially fusoid-ventricose and arising in the subhymenium, smooth or with one or more bumps or short projections, some branched at or near apex, in most the ventricose portion above the midpoint and narrowed evenly to an obtuse to subacute apex, without an appreciable neck, hyaline, thin-walled, not staining in Melzer's solution; cheilocystidia filamentous and contorted or clavate and covered with minute rods or warts (all degrees of variation present); gill edges beneath cystidia gelatinous; gill trama yellow to orange brown in iodine, of enlarged cells somewhat interwoven, subhymenium gelatinous and filamentous-interwoven; pileus trama with a thick gelatinous pellicle, the surface of which is covered by a thin layer of nongelatinous strongly diverticulate hyphae and with intermingled cells resembling the cheilocystidia, the arrangement of the gelatinous hyphae beneath this layer more or less vertical to surface of pileus; clamp connections present.

Habit, habitat, and distribution.—Single or in groups of 2–3 on dead branches of conifers, summer and fall. It is known from the Douglas Lake region as well as from the Rifle River area of the Conservation Department at Lupton.

Observations.—This is a dark-gray to olivaceous-gray or pallid fungus most closely resembling *Mycena vulgaris* in appearance, but differing in having somewhat fusoid pleurocystidia and a habitat definitely on dead branches and sticks of conifer wood, that is, truly lignicolous. It is closest to *M. pelliculosa* but differs in being distinctly lignicolous and in having pleurocystidia of only one type, that is, fusoid-ventricose. From information available, *M. Austini* is a white fungus with narrower pleurocystidia and cheilocystidia similar to pleurocystidia—whether or not it is truly distinct from the cespitose southern *M. glutinosa* is somewhat questionable.

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The interesting feature in regard to *Mycena mackinawensis* is that it helps to fill in a series of distinct taxa starting with *M. vulgaris* and ending in *M. Leaiana*. At first glance it appears utterly ridiculous to suggest a true relationship between them. If, however, we assume that established morphological differences are less subject to change in the process of evolution than physiological differences, we have the following situation: The spores are about alike in all, the structure of the pileus, gills, and stipe is very similar, and the various types and arrangements of cystidia are ordinary for the genus. The changes which have occurred are in the shape and distribution of the cystidia, but, again, even these are ordinary for Mycena, and a similar pattern of change is present in nearly every section of the genus, and it does not appear to be correlated with color or manner of growth.

The species are also similar in the pigments, progressing from the fuliginous type to the leuco type (lack of color) and then to the yellow to orange types. All these are intracellular. The enzyme systems have changed slightly at least, to the extent that a fungus capable of living on needle beds under conifers has given rise to types which survive best on the actual wood of conifers, and these in turn have given rise to types which do best on the wood of hardwoods or are limited to that substratum. The fascinating features of the problem are that here we have, in our flora, taxa representing all the important stages in this supposed evolutionary sequence, and that the majority of the taxa are endemic to North America. We have, as a starting point, *Mycena vulgaris*, circumpolar in distribution and inhabiting needle beds under conifers. Then comes *M. mackinawensis*, very similar to *M. vulgaris* in all characters except habitat (wood of conifers) and the presence of a certain type of pleurocystidium. The cheilocystidia are not sufficiently different to be a reliable species character, and the degree of gelatinization of the gill edge is in the same category. From *M. mackinawensis* we go to *M. Austini*, which is still on wood of conifers, but is white (lacking pigment) and with cheilocystidia different from those in the species named above. *M. glutinosa* may be only a southern cespitose variety of *M. Austini*, which has gone over to hardwood. At this point we find *M. euspeirea* and *M. texensis* differing in characters of pigment from *M. glutinosa*. *M. euspeirea* is fuliginous, and *M. texensis* is apparently so, but with a tendency to yellow in age or

when drying. These differ from *M. Leaiana* f. *pallida* in minor characters, such as lack of pale yellow gill edges and slight differences in cystidia. The habitat remains essentially the same. Finally, at the end of this line from *M. vulgaris* we have *M. Leaiana* f. *Leaiana*, with brilliant orange pileus, orange gill edges, and growing clustered on hardwood logs. The geographical evidence points to the conclusion that evolution has been from the species with wide distribution (*M. vulgaris*) to those of limited distribution.

16. *Phaeocollybia Christinae* (Fr.) Heim

This fungus is beautifully illustrated in Icones Farlowianae, Pl. 53. 1928. The Tahquamenon collection checked exceedingly well macroscopically with this plate, and the spore size is that reported for American material. A detailed account of the microscopic characters of Smith 38033 is given here for comparison with the other species.

Spores 8–10 × 4.5–5 μ, ovate in face view, in side view inequilateral, very minutely roughened, rusty ochraceous in KOH; basidia hyaline in KOH, four-spored, 20–26 × 5.5–7 μ; no pleurocystidia; cheilocystidia fusoid to hairlike or subcapitate, 20–30 × 4–6 μ; gill edge with many fertile basidia; gill trama weakly ochraceous to hyaline in KOH, the hyphae parallel and with short-cylindric cells, subhymenium inconspicuous; pileus trama with a well-developed gelatinous pellicle of smooth hyaline hyphae 3–4.5 μ in diam., the area beneath of compactly arranged incrusted hyphae of larger diameter, the flesh proper floccose-interwoven and nearly hyaline; clamp connections absent.

Habit, habitat, and distribution.—Gregarious under hemlock and hardwoods, Lower Falls, Tahquamenon Falls State Park, Aug. 20, 1951, Smith 38033.

Observations.—Singer (1951, p. 566) remarks of Phaeocollybia: "... all hyphae with clamp connections." This is not at all true of my collection. After a diligent search I failed to find a single clamp or indication of one. But there cannot be the slightest doubt that the fungus is a typical Phaeocollybia in all its other characters. If European material has clamped hyphae and possibly slightly different spores, as some descriptions and Singer's statement might indicate, there may be reason to regard the Tahquamenon collection as representing a new species.

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17. *Phaeocollybia Jenniae* (Karst.) Romagnesi

(Pl. III)

Pileus 1–3 cm. broad, broadly conic with an inrolled margin, becoming plano-umbonate, the umbo conic, glabrous, *viscid*, near "chestnut" (deep ferruginous red) fading to "burnt sienna" (ferruginous) and finally a paler orange tan, hygrophanous; flesh thickish, firm, cartilaginous, bitter; lamellae close to crowded, narrow, adnexed, dingy ochraceous when young, cinnamon in age, edges even; stipe 5–9 cm. long, 2.5–4 mm. thick at apex, narrowed downward into a tapered pseudorhiza, about concolorous with pileus (ferruginous red) but darkening to deep purple brown from the base up, extreme apex pallid tan to brownish.

Spores 5–6.5 × 3.2–3.7 μ, ellipsoid to subovoid, in side view with a slight suprahilar depression, ochraceous in KOH and in Melzer's solution, slightly roughened (use oil immersion); basidia four-spored, 19–23 × 4.5–5.5 μ; no pleurocystidia; cheilocystidia rare to scattered, 18–24 × 3–5 μ, hairlike to narrowly fusoid, hyaline; gill trama parallel, of short-cylindric cells, hyaline or nearly so in KOH, subhymenium inconspicuous; pileus trama homogeneous and interwoven beneath a pellicle of narrow radial hyphae with ochraceous pigment incrusted on the walls (as revived in KOH), these hyphae subgelatinous on surface of cap, nongelatinous below; no clamp connections seen.

Habit, habitat, and distribution.—Gregarious under Pteridium near an old pine stump in very sandy soil, Tahquamenon Falls State Park, at the Lower Falls, July 16, 1951, coll. Chester Leathers (Smith 36892), and again July 23 (Smith 37092).

Observations.—A careful search was made for clamp connections on this species, also, but none were found. No record of the odor was made, but the taste may indicate that the Tahquamenon collections represent a distinct taxa. Lange's illustration (1939) depicts our collections very well, but he did not give data on odor or taste. *Phaeocollybia Jenniae* is very close to *P. radicata* (Murr.) Singer, but the latter, according to my notes, lacks a bitter taste and has paler smoother spores. In addition, clamp connections are present in *P. radicata*. *P. attenuata* (Smith) Singer has larger spores than are found in either *P. Jenniae* or *P. radicata*, and different colors.

Marasmius fuliginellus R. Fries, Göteborgs kungl. vetenskaps- och vitterhetssamhälles Handlingar, Fjärde Följden, 3: 28. 1901.

Pileus (5) 10–25 mm. broad, convex with a slightly incurved margin, sometimes papillate, often becoming flattened-campanulate or with a small central abrupt depression, sometimes rugose in the depression, margin becoming slightly sulcate-striate to irregular or crenate, in age sometimes lacerate, at first often hoary-pruinose, with a pallid to yellowish pruinosity, soon naked, color "russet" to tawny or ochraceous tawny, when faded and old near "warm buff" (yellow), sometimes staining ferruginous in age; flesh very thin and pliant, concolorous with pileus and fading with it, odor and taste not distinctive; lamellae close to subdistant (15–20 reach the stipe), 1–2 tiers of lamellulae, narrow, moderately broad in age (about 1.5 mm.), broadly adnate becoming short-decurrent, a few forked near the stipe, many forked near cap margin, pale yellow ("Naples yellow"), or a dingy yellow, strongly intervenose; stipe (2) 3.5–8 cm. long, 1–2.5 mm. thick at apex, equal above a small bulb coated with a tawny mass of mycelium and debris often quite firmly held by the hairs, pliant, tubular, date-brown to dark brown or bay below, pale tawny to ochraceous above, covered overall by a rusty pubescence or pruinose coating.

Spores 5.5–7 × 3–4 μ, ellipsoid, immature spores dark violet in Melzer's solution and minutely roughened, smooth at maturity; basidia four-spored, 26–32 × 5.5–7 μ, hyaline in KOH; no pleurocystidia; cheilocystidia rare to scattered, 26–30 × 4–7 μ, subcylindric to slightly ventricose, the apex obtuse to subacute, forked in some, occasionally contorted above; gill trama rose-red to orange red in KOH; pileus trama with a pellicle appearing cellular in tangential section (hyphae radially arranged), tissue beneath intricately interwoven and both orange red in KOH; clamp connections present.

Habit, habitat, and distribution.—Gregarious to scattered under conifers, in sphagnum bogs, and on very decayed wood of pine and Douglas fir, especially where this is found as debris on the forest floor. It is actually a common species in the northern Rocky Mountains and along our Pacific coast. It appears, however, to be rare to uncommon in Michigan, where it fruits mostly during wet seasons.

Observations.—This is a much-named fungus, but when once well known, an easy one to recognize in the field. The cheilocystidia

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are generally rare and not of much value as a taxonomic character so far as their presence or their absence is concerned. There is an aspect which distinguishes it from all the specimens of *Xeromphalina fraxinophila* I have seen, but which it is hard to put into words.

3. **Xeromphalina fraxinophila**, sp. nov.

Pileus 10–30 mm. latus, subspadiceus demum dilute fulvus, glaber; lamellae adnatae vel subdecurrentes, confertae, melleae; stipes 5–7 cm. longus, 2–3.5 mm. crassus, deorsum fulvo-strigosus; sporae 4.5–5.5 (6) × 2.5–3.3 μ. Specimen typicum, in Herb. Univ. Mich. conservatum, ad ligna Fraxini prope Kent Lake, Oct. 2, 1945, Smith n. 20902.

Pileus 10–30 mm. broad, broadly convex with an incurved margin, soon umbilicate and margin arched or finally spreading, sometimes wavy to crenate, surface moist but faintly hoary in buttons, hygrophanous, "bister" at first, gradually paler and finally ochraceous tawny on the margin, becoming dingy ochraceous tawny to dark buckthorn brown over disc, margin closely striatulate when moist, surface often concentrically zoned in age; flesh concolorous with surface, thin and pliant, odor and taste not distinctive; lamellae "honey-yellow," narrow, adnate to subdecurrent, close to nearly crowded, 2 tiers of lamellulae, often intervenose, edges even; stipe 5–7 cm. long, 2–3.5 mm. thick, equal or enlarged slightly either way, evenly brownish pubescent overall and base with conspicuous tawny-yellow matted tomentum, apex orange brown, lower portion dark reddish brown beneath the pubescence.

Spores 4.5–5.5 (6) × 2.5–3.3 μ, white in deposit, pale gray blue in Melzer's solution, smooth or immature spores very minutely roughened, ellipsoid; basidia four-spored, 26–30 × 5–6.5 μ, hyaline in KOH; no pleurocystidia or cheilocystidia seen; gill trama yellow in water mounts of fresh material (pigment in the wall), in Melzer's solution yellowish, in KOH bright pinkish red fading to orange brown, interwoven, subhymenium narrow, compactly interwoven; pileus trama with a well-formed nongelatinous cuticle of radial hyphae having cells slightly broader than those of flesh proper (cuticle appearing cellular in tangential sections), cuticle and flesh red in KOH and fading to orange brown; clamp connections present.

Habit, habitat, and distribution.—Gregarious-subcespitose on de-

bris of Fraxinus—branches, rotten logs almost reduced to humus, and old leaves—and at times on humus under these trees. Kent Lake, Oakland County, Mich., Oct. 2, 1945, Smith 20902 TYPE, 20903, Oct. 4, 1945, Smith 21051.

Observations.—This species is clearly in the same subsection as *Xeromphalina cauticinalis*. The color of the button stages is quite different, being a dingy yellow brown in the one on ash and a rich rusty brown in *X. cauticinalis*. The type locality has been cleared and is now part of the bottom of Kent Lake, so that there is no chance of collecting this fungus again in the type locality.

Subsection **Campanellae** (Singer), comb. nov. Pileus trama not becoming red or vinaceous in KOH; carpophores typically cespitose-gregarious on wood, pilocystidia rare and mostly near the margin on young pilei; pleurocystidia and cheilocystidia, when present, smooth and fusoid-ventricose.

4. *Xeromphalina campanella* (Fr.) Kühner & Maire

Bull. Soc. Myc. Fr., 50: 18. 1934

(Pl. VI)

Agaricus campanella Fries, Syst. Myc., 1: 166. 1821.
Omphalia campanella Kummer, Führer in die Pilzk., p. 107. 1871.
Omphalina campanella Quélet, Exchir. Fung., p. 45. 1886.
Omphalopsis campanella Earle, Bull. N. Y. Bot. Gard., 5: 425. 1909.

Pileus (5) 10–25 mm. broad, convex when young, becoming broadly convex to plane and soon developing a depressed disc, surface glabrous and moist, opaque at first, becoming striate before losing moisture and fading, the margin curved in slightly at first but soon straight, color dull orange yellow to tawny, the margin near "yellow ocher" at first and the disc "ochraceous tawny," becoming darker tawny in age and finally tawny or near "cinnamon-brown" overall, sometimes "yellow ocher" overall when young and becoming "clay color"; flesh thin and somewhat pliant, yellow, odor and taste not distinctive; lamellae arcuate-adnate at first, becoming deeply decurrent, thickish, intervenose, subdistant, narrow, tapering to margin of cap, pruinose; stipe 1–4 (5) cm. long, 1–2 mm. thick, with a small tubule, curved or straight, more or less yellow ocher overall at first and covered by a yellowish pruina, becoming glabrous

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near apex, base becoming strigose from tawny to fulvous mycelial hairs, horny-cartilaginous in texture and darkening from the base upward in age, finally almost date-brown overall except the apex.

Spores 6–7.5 × 3–3.5 μ, hyaline, smooth, bluish in Melzer's solution, narrowly ellipsoid to subcylindric; basidia four-spored, (22) 24–28 × 5–5.5 μ; pleurocystidia scattered, ventricose to subcylindric, thin-walled and smooth, 26–40 × 8–14 μ, apices obtuse, contents hyaline; cheilocystidia similar to pleurocystidia but more abundant; gill trama of interwoven brown-walled (revived in KOH) hyphae; pileus trama homogeneous, hyphae brown-walled in KOH, and those over the surface slightly gelatinous; clamp connections present.

Habit, habitat, and distribution.—Gregarious to cespitose on decaying conifer wood throughout the United States and Canada. Common and abundant from spring to winter, depending on weather conditions. Along our Pacific coast it can be found during the winter months as well.

Observations.—Little need be said of this well-known fungus. It is described and illustrated in most mushroom books under the name "*Omphalia campanella*." As Singer (1951) points out, it can be used as an indicator for conifer wood, an item of some importance since the logs upon which it grows are often moss-covered and in advanced stages of decay. In regions where oak is present, however, *Xeromphalina Kauffmanii* may be expected.

5. **Xeromphalina Kauffmanii**, sp. nov.

(Pl. V, Fig. 4)

Pileus 5–25 mm. latus, convexus, demum subinfundibuliformis, ferrugineus demum fulvus; lamellae latae, subdistantes, angustae, decurrentes; stipes 1–4 cm. longus, 1–2 mm. crassus, ferrugineus; sporae 5–6 × 3–3.3 μ. Specimen typicum, in Herb. Univ. Mich. conservatum; ad ligna Querci, Chelsea, Mich., June 29, 1940, Smith n. 13156.

Pileus 5–25 mm. broad, broadly convex at first, soon with a slight depression at the center and plane to the decurved margin, in age the margin becoming elevated at times and then shape more funnel-like, margin incurved at very first, surface glabrous, color "cinnamon rufous" to "hazel" when young (bright ferruginous),

margin soon yellowish and striatulate, fading slowly (as if subhygrophanous) to dingy yellowish; flesh thin, odor and taste not distinctive; lamellae close to subdistant, narrow, decurrent, near "ochraceous buff" (pale yellow), strongly intervenose; stipe 1–4 cm. long, 1–2 mm. thick, enlarged above, ferruginous above ("cinnamon rufous"), darker red brown below ("Kaiser brown" to "liver-brown"), minutely and evenly pubescent at first, in age glabrous above, somewhat horny in consistency, with rusty-brown to tawny-brown mycelium at base.

Spores 5–6 × 3–3.3 μ, ellipsoid, gray blue in Melzer's solution, smooth at maturity but when immature indistinctly roughened with minute granules which turn bluish in Melzer's solution, basidia four-spored, hyaline in KOH; pleurocystidia and cheilocystidia similar, scattered, 40–70 × 8–12 μ, narrowly fusoid-ventricose to subcylindric, apices obtuse, hyaline, smooth; gill trama ochraceous to slightly darker and with a thin nongelatinous pellicle of narrow hyphae, flesh beneath the broad somewhat thick-walled cells subgelatinous in KOH and rusty yellow in KOH; clamp connections present.

Habit, habitat, and distribution.—Densely cespitose on oak stumps during late spring and early summer, near Chelsea, Michigan, June 29, 1940, Smith 15156 TYPE; other collections from Michigan are: Smith 1463, 6417, 7017, 7106. Kauffman made collections from North Carolina and Pennsylvania and had studied a collection of mine from Michigan made July 9, 1929.

Observations.—Singer (1951) comments on an undescribed species resembling *Xeromphalina campanella* but growing on hardwood. It must be the one here named in honor of Professor C. H. Kauffman. It can usually be distinguished from *X. campanella* by the more ferruginous pilei of young stages as well as by the difference in the gill trama and habitat. One must distinguish, however, between freshly developing clusters and clusters which have become arrested in their development. As often happens in *Marasmius candidus*, many more buttons are formed than ever reach maturity, and the colors in these fade, as do those of the mature caps.

Subsection **Orickianae**, subsec. nov. Pigmentum pilei in KOH vinaceo-fuscum; pilocystidia ochracea. Typically cespitose to gregarious and, so far, known only on redwood.

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6. *Xeromphalina orickiana* (Smith) Singer

Lilloa, 22: 368. 1951

(Pl. VII)

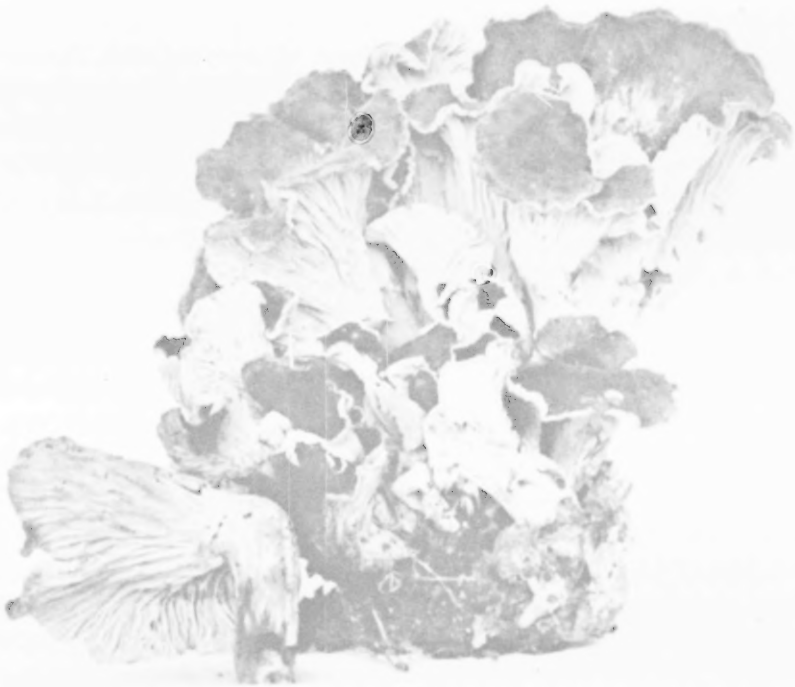
Omphalia orickiana Smith, Mycologia, 30: 36. 1938.

Pileus 10–25 mm. broad, convex, umbilicate or the margin spreading and the disc depressed, at times becoming broadly funnel-shaped with a wavy or subcrenate margin, surface moist to dry, faintly innately fibrillose under a lens, fibrils more numerous around the disc and scattered near margin, color evenly "dark vinaceous brown," margin incurved at first and at times faintly striatulate; flesh thin, hardly tapering toward margin, "dark vinaceous brown," pliant and cartilaginous, odor and taste not distinctive; lamellae narrow, crowded, short-decurrent, at first "pale grayish vinaceous" becoming darker and near "sorghum-brown" at maturity, edges even; stipe 1–3 (4) cm. long, 1.5–2 mm. thick, apex usually enlarged slightly, base often attenuated, surface tawny tomentose below, minutely pruinose above, concolorous with the pileus or darker, tubular.

Spores 4.5–6 × 2–2.5 (3+ μ (4–4.5 × 2 μ in mounts of dried material), subcylindric to narrowly ellipsoid, smooth at maturity, pale blue in Melzer's solution; basidia four-spored, 18–20 × 3–4 μ, hyaline in KOH; pleurocystidia scattered, (24) 30–40 × 8–14 μ, fusoid-ventricose to subcylindric or submucronate, hyaline in KOH, thin-walled, smooth, apices obtuse; cheilocystidia scattered to abundant, similar to pleurocystidia but size more variable, some clavate, some obovate, some fusoid-ventricose, hyaline and smooth; gill trama subparallel to interwoven, dark vinaceous brown revived in KOH (when fresh, vinaceous red in KOH), brown in H_2O mounts of fresh material, pileus trama colored like gill trama in KOH except for the cuticular layer, which is golden brown and not gelatinous, numerous pilocystidia arising from the golden-brown cuticular layer and these 20–50 × 6–12 μ, subcylindric, narrowly clavate, subventricose, or somewhat irregular in shape and with thickened, smooth, golden-brown walls as revived in KOH, pigment incrusted on the prostrate hyphae, the cells immediately beneath the golden-brown layer pallid vinaceous in KOH, radially arranged, and larger in diameter than those of the flesh proper (which are dark vinaceous

PLATES I–VIII

1763



Cantharellus cinereus f. *multipes* Smith. × 1

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FIG. 1. *Xeromphalina cauticinalis* (Fr.) Kühner & Maire. × 1

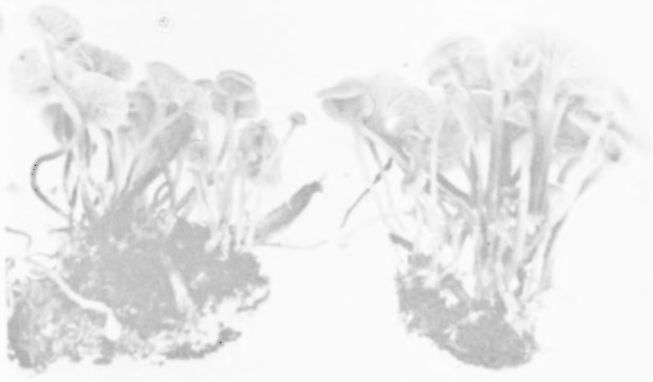

FIG. 2. *Xeromphalina Kauffmanii* Smith. × 1

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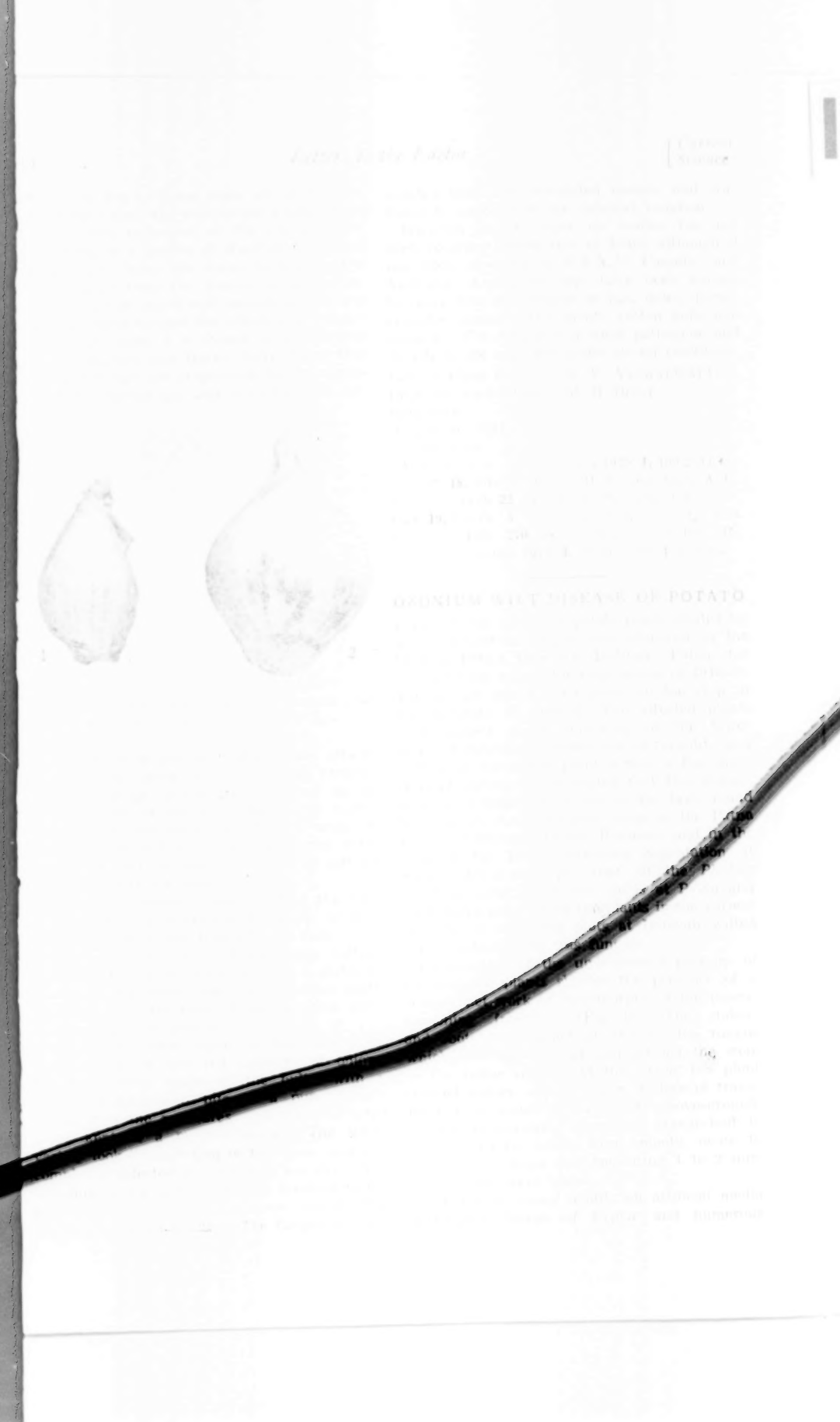
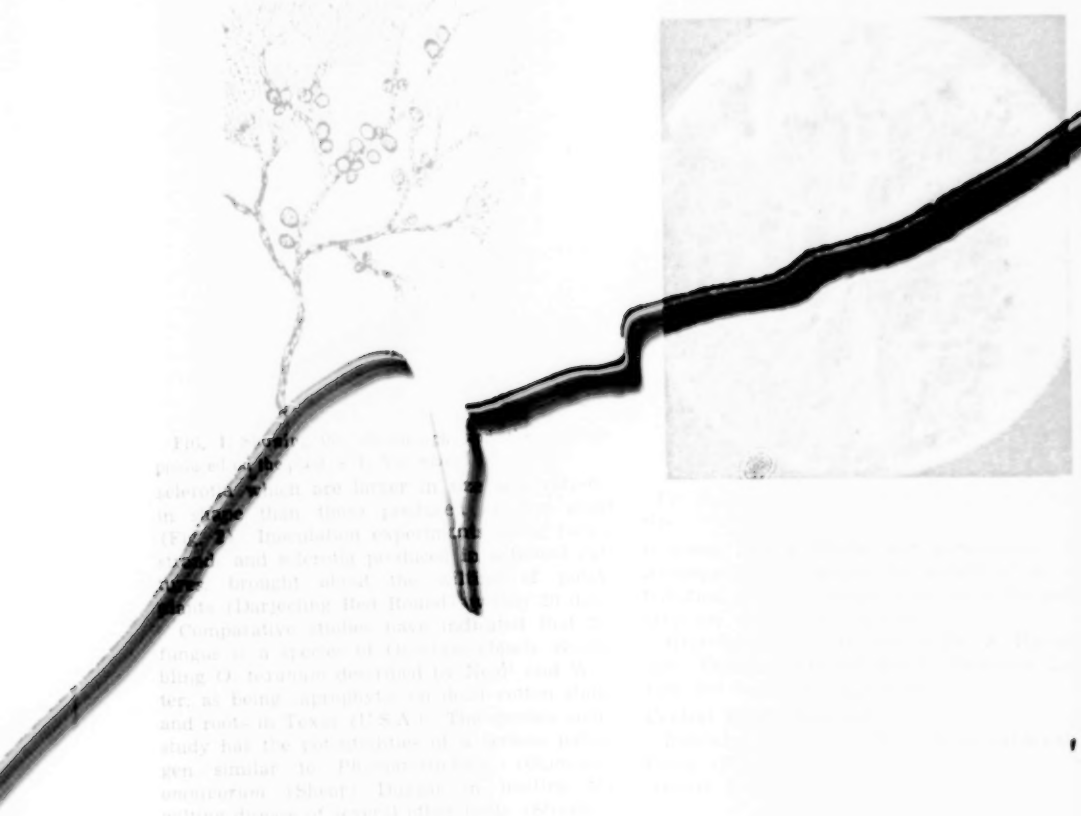
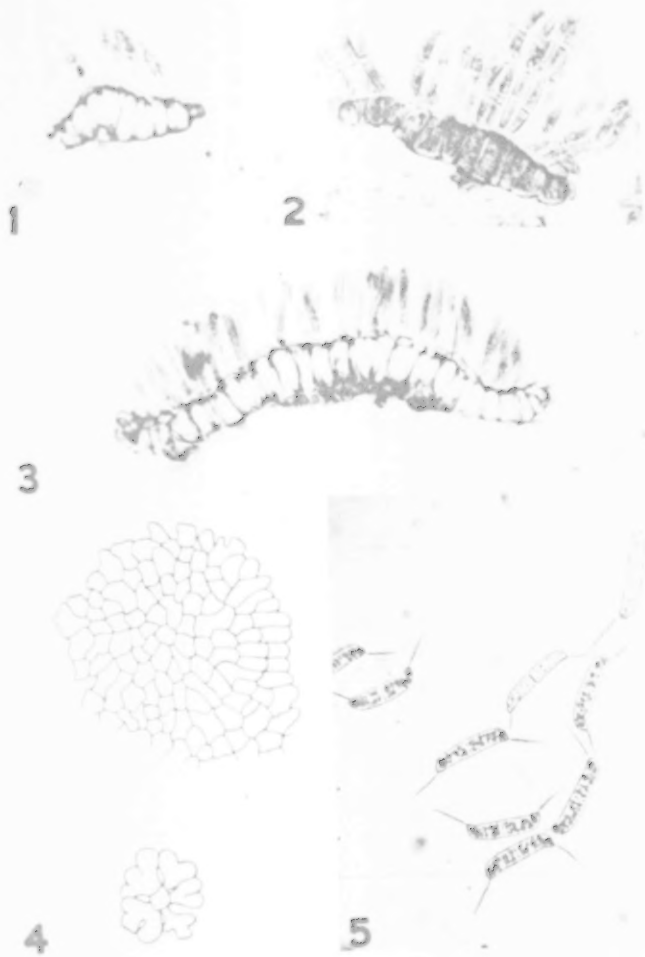
Fig. 1. *Xeromphalina kauffmanii* (Shw.) Smith. × 1

Fig. 2. *Xeromphalina fulvipes* (Murr.) Smith. × 1



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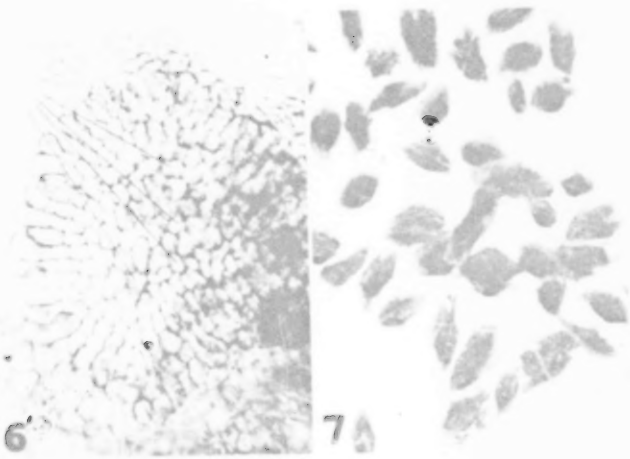
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conidia with a seta at each end. However, they differ in that they are produced on branched conidiophores in black setulate pycnidia that are first enclosed but become cup shaped as they mature. *Discosporium* (4) produces hyaline 1-celled conidia that are setulate at each end. They are borne on linear conidiophores in cup-shaped black setulate pycnidia. The conidia of *Didymothozetia* (8) are 1-septate, 1-setulate at each end; but they are borne singly on ovoid conidiophores on globose hyaline sporodochia, and the setae are attached somewhat laterally. The legume fungus is distinguished from the above genera by the production of conidia directly from the cells of a superficial, one cell thick, radially developing stroma that is completely open at all stages. In addition the legume fungus has a prominent sclerotial stage.

The original description of *Pseudodiscosia* (7) refers to *Discosia*-like conidia produced directly from the cells of an acervulus. Later Ruddin and Wakefield (1) reported conidiophores as present and their illustration of conidia bears little or no resemblance to conidia of *Discosia*. Grove (4) states: "It was said to resemble *Discosia* somewhat in its spores but that was a misconception." A genus having the characteristics of the legume fungus has apparently not been described and it becomes necessary to establish a new genus.

Leptodiscus gen. nov.

Sclerotia parva, nigra, sphaeralia vel fusiformia; acervuli superficiales, flavi vel fusci, scutiformes, qui e cellulo centrali radialiter orti stroma tenue efficiunt ad mensuram unius celluli crassum; conidiophora evanescentia; conidia lineari ordine in muco capitata; conidiorum parietes hyalini; conidia uno septo, una seta utrinque praedita.

Leptodiscus terrestris sp. nov.

Sclerotia nigra, sphaeralia vel fusiformia usque ad 1 mm. longa; acervuli superficiales, flavi vel fusci, scutiformes, qui e cellulo centrali radialiter orti stroma tenue efficiunt ad mensuram unius celluli crassum, et saepe inter sese nullo ordine consocientes stroma efficiunt usque ad 200 × 800 μ diametro; conidiophore evanescentia; conidia in summo stromate nata, lineari ordine in muco capitata; conidiorum parietes hyalini quod eis interclauditur

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decolor vel flavum, interdum ad fulvum vergens; conidia cum adoleverint uno septo praedita, allantoidea, una sctula utrinque praedita, 20–34.8 μ longa, 4.4–7 μ lata. Setae 8.7–18 μ longae.

The type is represented by a single-spore culture isolated from a diseased red clover root collected on the Agronomy South Farm of the Illinois Agricultural Experiment Station, Urbana, Illinois, in September, 1951. Material of the type has been placed in the Mycological Collection of the U.S.D.A. Bureau of Plant Industry, Soils and Agricultural Engineering, Beltsville, Maryland, and the Herbarium of the University of Illinois, Urbana, as Mycological Collection No. 31, 258.

The fungus has been collected in different areas of Illinois, at Beltsville, Maryland, and Richmond, Virginia.

SUMMARY

An undescribed fungus causing damping-off and root rot of various Leguminosae is described and placed in a new genus, *Leptodiscus*. The genus is distinguished by the production of small black sclerotia, the superficial, thin radiate stroma upon which the spores are borne, and by the 1-septate conidia which have one filamentous seta at each end. The species has been designated as *Leptodiscus terrestris*.

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URBANA, ILLINOIS.

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appearance when immature but becomes nearly brown when mature. The telia consist of subepidermal crusts (Fig. 1, B) of unicellular teliospores produced catenulately. Lateral adherence of the chains is not great, and as the sorus reaches maturity they separate in varying degrees and fall from the sorus, leaving only the bounding ruptured epidermis of the host. Germination of the secondary teliospores has not been observed. While obscure, there is some evidence that there may be two or three germ pores in the species on *Astilbe* and this is certainly true of *P. hashioka*.

THE SPECIES OF PUCCINIOSTELE

PUCCINIOSTELE CLARKIANA (Barcl.) Diet. (Engler's Bot. Jahrb. 27: 564. 1899) occurs on *Astilbe congesta*, *A. japonica*, *A. kiusiana*, *A. longicarpa*, *A. macrophylla*, *A. rivularis*, and *A. thunbergii* in China, India, and Japan.

The species develops spermogonia, caeomoid aecia with the aeciospores measuring 16–24(–26) × (21–)24–32(–35) μ and having an apical wall 4–10 μ in thickness, primary telia in the aecia, and secondary telia. Uredia are not known.

PUCCINIOSTELE MANDSCHURICA Diet. (Ann. Mycol. 2: 21. 1904) occurs on *Astilbe chinensis* and *A. microphylla* in China, Japan, Korea, and Manchuria.

The species forms spermogonia, caeomoid aecia with the aeciospores measuring (14–)17–24 × (18–)22–28(–30) μ and having the apical wall uniform or thickened to 4 μ, primary telia in the aecia, and secondary telia. Uredia are unknown.

PUCCINIOSTELE SYDOWII Liou & Wang (Chinese Journ. Bot. 1: 81. 1936) occurs on *Astilbe* sp. in India. Only telia are reported. It is doubtful if this species differs from *P. clarkiana*.

Pucciniostele philippinensis sp. nov.

Spermogoniis amphigenis, subcuticularibus, lenticularibus, 45–60 μ altis, 120–200(–275) μ latis, sine paraphysibus. Aecius caeomoideis, hypophyllis vel caulicolis, magnis, frequenter confluentibus, rotundatis vel elongatis et usque ad 2 cm longis, aurantiacis; aeciosporis variabilibus sed plerumque oblongis vel oblongo-ellipsoideis, (17–)20–26(–30) × (29–)32–40(–43) μ, membranis 2–3 μ cr. ad apicem 8–15(–20) μ cr., moderate verrucosis, hyalinis. Urediis sparsis, hypophyllis, aureis, peridio ex cellulis cuboideis, 12–15 μ

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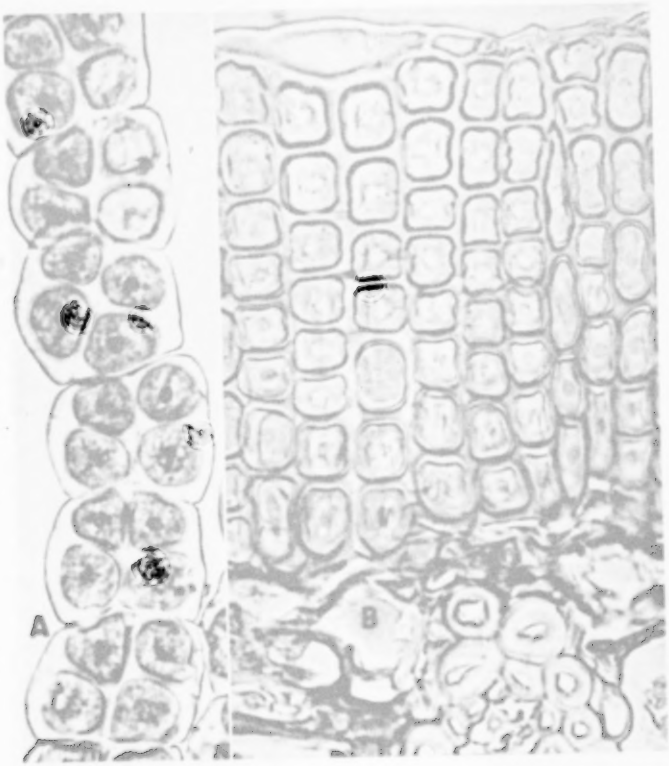

FIG. 1. Types of teliospores produced by the species of *Pucciniostele* on *Astilbe*. A. Primary teliospores of *P. clarkiana*. This spore form develops in aecial sori. The characteristic tetrads of spores do not adhere laterally but are attached vertically, resulting in chains of tetrads. B. Secondary telia of *P. mandschurica* in section. These telia occur later in the season than the primary telia and are not associated with the aecial infections. The unicellular spores are strongly adherent vertically but the chains tend to separate laterally at maturity. Both kinds of telia are known in *P. clarkiana*, *P. mandschurica*, and *P. philippinensis*. Germination has not been observed in either type. ×800.

diam., flavidis, membranis 1.5–2 μ cr. instructis; uredosporis catenulatis, oblongis vel oblongo-ellipsoideis, 17–24 × 26–31 μ, membranis hyalinis, 2 μ cr. vel ad apicem 4 μ cr., moderate verrucosis. Telis primariis ex aeciis ortis, teliosporis primariis irregularibus plerumque ex 4-cellulis compositis,

19-22 × 26-32 μ, cellulis singulis plus minusve cuboideis, pallide aureis; teliis secundariis sparsis, hypophyllis, subepidermalibus, aureis, rotundatis, 0.1-0.6 mm diam., teliosporis 4-8 in catenas cylindraceas connexis, sporis individuis cuboideis, 13-14 × 10-15 μ, membranis pallide flavidis, 1-1.5 μ cr.

On leaves, petioles, stems, and inflorescence of *Astilbe philippinensis* Henry in the Philippine Islands. The type of the species is Clemens No. *51787* collected on Mt. Santo Tomas, Benguet Prov., Luzon, Mar. 26, 1935.

P. philippinensis differs from *P. clarkiana* and *P. mandschurica* in several respects. Uredia apparently occur only in *P. philippinensis*. It has the largest aeciospores and the greatest apical thickening of any of the species of the genus. In these respects the species form a series from large spores to small spores as follows: *P. philippinensis*, *P. clarkiana*, *P. mandschurica*. Since aeciospores have not been reported in *P. sydowii* it cannot be compared. Peridium-like cells adherent to the epidermis are prominent in *P. philippinensis*, occur in some collections of *P. clarkiana*, but have not been observed in *P. mandschurica*. Spermogonia are present in all three and are much alike. No dependable differences could be found in the primary or secondary telia. The secondary telia of *P. philippinensis* were found only in immature condition so that the length that the spore chains may attain is uncertain.

PUCCINIOSTELE HASHIOKAI (Hirat. f.) Cumm. (Mycologia 42: 790. 1950) occurs on *Ampelopsis cantoniensis* in China and Formosa.

Spermogonia and aecia are unknown in this species. It forms uredia with peripheral paraphyses and echinulate spores and secondary telia. The discovery of the aecia will be necessary before the relationships of this species can be decided. While the telia and teliospores are generally similar to those of the species on *Astilbe* the phakopsoroid uredia are much different.

DISCUSSION

The relationships of *Pucciniostele* are obscure. Dietel (2) and the Sydows (6) place the genus in the Pucciniaceae with several other genera of dubious affinities. On the other hand Kursanov

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et al. (4) and Hiratsuka (3) consider that the genus belongs in the Melampsoraceae. The latter treatment seems the more logical for several reasons: 1) peridiate uredia are common in the Melampsoraceae but very rare in the Pucciniaceae; 2) catenulate urediospores occur in the Melampsoraceae but not in the Pucciniaceae; and 3) catenulately produced teliospores adherent in chains occur in the Pucciniaceae only in the Pucciniostreae, a tribe of anomalous and mostly microcyclic genera. The lack of strong lateral adherence of the chains of teliospores is the only character present in *Pucciniostela* that would indicate relationship with the *Pucciniaceae*.

In the Melampsoraceae catenulate urediospores occur in *Mesopsora* (spermogonia and aecia unknown), in *Chrysomyxa* (aecia on *Picea*), and in *Coleosporium* (aecia on *Pinus*). The teliospores also occur in chains in *Chrysomyxa* and there is a very close similarity between the aeciospores and the urediospores of any one species, as pointed out by Saville (5), and this is also true of *Pucciniostele*. On the other hand, the aecia of *Chrysomyxa* are peridermioid and the teliospores have non-pigmented walls and germinate without a dormant period. The teliospores of *Pucciniostele* are only slightly pigmented but apparently are not germinable at maturity. Moreover, the spermogonia of *Chrysomyxa* are subepidermal. *Coleosporium* has subepidermal spermogonia and peridermioid aecia and, in addition, the teliospores produce internal basidia and are not typically catenulate. If *P. hashiokai* actually belongs in *Pucciniostele*, relationship to the *Phakopsora-Angiopsora* complex is possible. As mentioned above, this species has phakopsoroid uredia. Most species of *Angiopsora* also have such uredia and produce their teliospores in chains. Aecia have been reported only for *Phakopsora hansfordii* Cumm. (*Angiopsora hansfordii* Thirum. & Kern 1949, not *A. hansfordii* Cumm. 1945). In this species the spermogonia are similar in position and morphology to those of *Pucciniostele* but the aecia have a peridium. Moreover, in *Angiopsora* and *Phakopsora* the lateral adherence of the teliospores is stronger. *Phragmidiella* has similar telia, subcuticular but paraphysate spermogonia, uredinoid subcuticular aecia, and pedicellate urediospores.

The hosts of these two fungi are different. In the United States the fungus has been found only on Douglas-fir. It has not been observed on spruce, hemlock, Sitka spruce, true firs, or on pine species in any areas where the writer has made observations. However, a sufficiently thorough search has not been made in some areas of the West to be sure it does not occur on some other host. On the basis of present information, it seems desirable to designate the western fungus a form of *E. coerulescens*:

Endoconidiophora coerulescens Münch forma **douglasii** f. nov.[1] (Fig. 3).

Perithecia atra, hirsuta, 160–190 μ lata, 180–210 μ alta, rostellis basi 30–40, apice 12–16 μ latis, 500–1000 μ longis, filamentis hyalinis 15–25 μ longis, basi 2 μ, ad apicem ad 1 μ attenuatis praeditis; ascosporae subcurvatae, hyalinae, 6–9 × 1.7–2 μ; endoconidiophora 50–250 μ longa, 5–10 μ crassa, alia apice attenuata, alia supra inflata; conidia 4–30 × 3–8 μ, hyalina, catenulata.

In ligno *Pseudotsugae taxifoliae* U. S.

Perithecia black, hirsute, 160–190 × 180–210 μ high, with necks 30–40 μ wide at base to 12–16 μ wide at tip and 500–1000 μ long, ostiolar filaments hyaline, 15–25 μ long, and tapering from about 2 μ at the base to 1 μ at tip; ascospores slightly curved, hyaline, 6–9 × 1.7–2 μ; endoconidiophores variable in length and thickness, 50–250 μ long by 5–10 μ thick, some tapering to smaller diameter at apex and others enlarged above; conidia variable in length and thickness, 4–30 × 3–8 μ, hyaline, in chains. Grows on cornmeal, malt, or potato dextrose agar media at temperatures slightly lower than ordinary room temperature of 25° C.

Collected on sapwood of *Pseudotsuga taxifolia* (Poir.) Britton in the western United States.

Type specimen (F. P. *70703*) deposited in the Mycological Collections, Bureau of Plant Industry, Beltsville, Md.

SINGLE-SPORE CULTURES. Twenty-three of 33 single conidial and single ascospore cultures developed fertile perithecia. Ten of the single-spore cultures developed no perithecia, either when grown separately or when grown together in all possible combinations. All ten nonperithecial cultures had perithecial primordia. Bakshi (1), who isolated *E. coerulescens* from pine wood in Eng-

[1] Latin diagnosis prepared by Edith K. Cash, Associate Mycologist, Division of Mycology and Disease Survey, Bureau of Plant Industry, Soils, and Agricultural Engineering, Beltsville, Maryland.

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land, considered the species to be homothallic but some of his single-spore cultures did not develop pertithecia.

An attempt was made to spermatize the 10 non-pertithecial cultures by streaking spores and mycelium from a single-spore pertithecial culture across 5-day-old petri-dish cultures. Fertile pertithecia developed at or near the margins of the 5-day-old growth

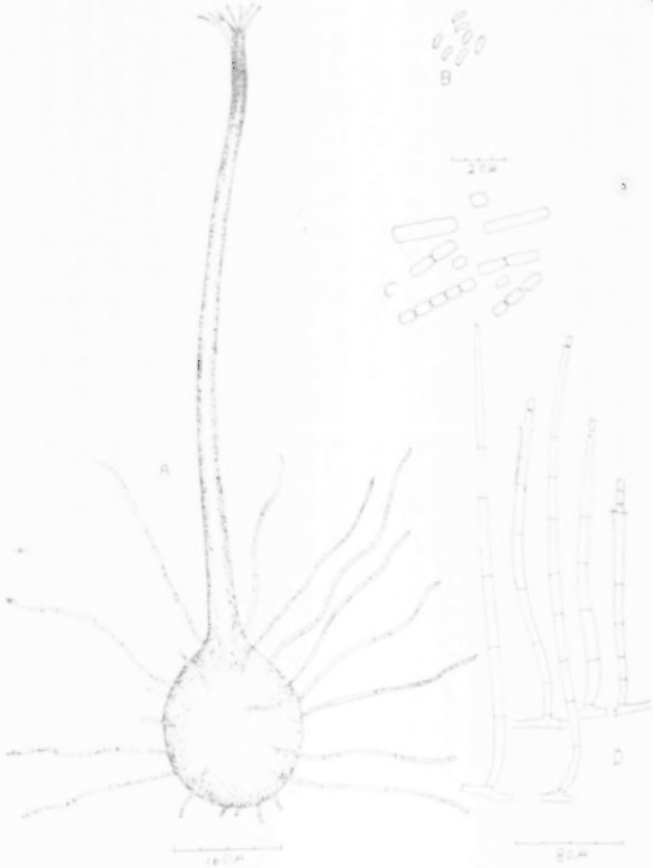

FIG. 3. *Endoconidiophora coerulescens* I. description. A. Pertithecium. B. ascospores. C. conidia. D. endoconidiophores with conidia.

A NEW SPECIES OF MONOBLEPHARELLA[1]

(WITH 1 FIGURE)

FREDERICK K. SPARROW[2]

The genus *Monoblepharella*, consisting of four species, is a small but interesting group of Phycomycetes by reason of the fact that the fertilized egg is propelled by the flagellum of the male gamete (Sparrow 1940; Shanor 1942; Springer 1945). It has assumed further interest with the discovery by Johns (1952) that members of the well-known genus *Gonapodya* possess an essentially similar type of sexual reproduction.

The purpose of the present paper is to report a species of *Monoblepharella* which is distinct in certain essential features from previously described ones, namely, in the apparent lack of antheridia (and antherozoids), and in the formation of apogamous oospores which remain within the oogonium. It was isolated from soil collected in a roadside ditch in the immediate vicinity of Clarksdale, Mississippi, February 16, 1949.

The mycelium was of the delicate, flexuous, pearly gray type described for other species of *Monoblepharella*. Although most species of the genus possess irregularities of the mycelium, the present fungus was noteworthy in this respect. Numerous, up to 9 μ in diameter, catenulate expansions of the hyphae were formed which in some instances strikingly resembled those found in *Gonapodya*. Further resemblance to the latter genus was found in the frequent emergence from the distal catenulation of two diverging hyphal elements. The contents of the hyphae were disposed in the usual reticulate fashion save in actively growing apices which were homogeneous.

Zoosporangia were abundantly formed at about 24.5° C. The precise temperature relationship has not, however, as yet been

[1] Paper no. 978, Department of Botany, University of Michigan.

[2] Acknowledgment is made to the Executive Board of the Horace H. Rackham School of Graduate Studies for a grant which made possible the collection of this and other fungi in the Gulf States.

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ascertained. These sporangia were of the usual siliquaeform type and were 34–47 μ long by 5–8 μ in diameter. They were borne either singly or in pairs at the tips of hyphae. After sympodial branching of the hyphae they appeared lateral, often in clusters (FIG. 1, a, b). The zoospores were ovoid to subcylindrical when swimming, 8 μ long by 5 μ wide, and possessed the usual monoblepharid internal structure and posterior flagellum (FIG. 1, b).

Oogonia were abundantly formed when water cultures were left undisturbed for several days at 30–31° C. They were obpyriform with rounded apex, narrow cylindrical base, and were 10–15 μ long by 7.5–8.75 μ in diameter, tapering to 2.5 μ at the base. Like other species of the genus, they contained in most instances (FIG. 1, e, compared with FIG. 1, f) a single egg bearing numerous large refractive globules. These oogonia were at first terminal (FIG. 1, g) but by sympodial branching of the hyphae often become lateral and occasionally clustered (FIG. 1, c, d, f, h).

No evidence has been found as yet for the existence of antheridia and antherozoids. This feature has been considered in some detail. Pure cultures on agar were obtained from which transfers were made to sterile soil water cultures baited with hempseed. Under these conditions an abundance of oogonia (and oospores) were formed, but so far as could be ascertained, no antheridia or other reproductive structures of any kind. Needless to say, this aspect of the fungus is still under investigation.

Under the aforementioned conditions oospores matured in profusion and these were uniformly endogenous. The latter fact was in agreement with observations in the original gross cultures and seemed to indicate that, typically, the oospores were endogenous and not so because of fouled environmental circumstances. Further work on the morphology and studies of the physiology of the fungus are being undertaken.

Since by reason of the aforementioned features the fungus is very distinct from other species of *Monoblepharella*, in which genus it undoubtedly belongs, it is described as new.

Monoblepharella endogena n. sp.

Mycelium amplum, hyphis tenuibus, flexuosis, ramosis, 2.5–6 μ dia. intus reticulate vacuolatis, plerumque multis irregularibus tumoribus ad 9 μ dia.

FIG. 1. a-h. *Monoblepharella endogena*. All × 970. a. Cluster of sporangia, two empty, a third developing. b. Zoosporangium discharging its zoospores. c, d. Mature endogenous oospores on hyphae developing new oogonia. e. Oogonium with four eggs. f. Cluster of mature oospores with new oogonia forming sympodially. g. Terminal oospore. h. Terminal oospore which by sympodial branching and subsequent oogonial formation of its supporting hypha appears lateral.

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Sporangia siliquiformia, 34–47 μ longa, 5–8 μ dia., apices hyparum terminantia vel singula vel bina vel post hyphae ramificationem sympodialem lateralia. Zoosporis ovoideis vel subcylindricis, 8 μ longis, 5 μ latis, postice cilio quam soma duplo vel triplo longiori praeditis. Oogonium primum terminale vel post ramificationem hyphae sympodialem sacpe lateralc, clavatum vel obpyriforme, apice rotundatum basi angustc cylindricum, 10–15 μ longum, 7.5–8.75 μ crassum basi ad diametrum 2.5 μ angustatum, maturitate ovo singulo (rare ad quatuor) magno, refractivis globulis praedito, incluso. Antheridium ignotum. Oospora endogena, spherica, 7.5–10 μ dia., crianque guttulata membrana paulum incrassata pallide brunnea laevia.

In humo, per *Cannabin* semen illecebram culta, coll. F. K. Sparrow, Clarksdale, Mississippi, Feb. 16, 1949.

Mycelium well developed, of tenuous flexuous branched hyphae 2.5–6 μ in diameter, with many irregular swellings up to 9 μ in diameter, contents reticulately vacuolate. Sporangia siliquaeform, 34–47 μ long by 5–8 μ in diameter, occurring singly or in pairs at tips of the hyphae or after sympodial branching appearing lateral; zoospores ovoid or subcylindrical, 8 μ long by 5 μ wide, the posterior flagellum 2–3 times the length of the body. Oogonium at first terminal or after sympodial branching of hypha appearing lateral; clavate or obpyriform with rounded apex and narrow cylindrical base, 10–15 μ long by 7.5–8.75 μ wide, tapering to 2.5 μ at base, the contents at maturity forming one, rarely up to 4 eggs bearing numerous large refractive globules. Antheridium and antherozoids unknown. Oospore spherical, 7.5–10 μ in diameter, endogenous, with a slightly thickened light-brown smooth wall, contents bearing globules.

In soil, cultivated on hempseed. Clarksdale, Mississippi, collected February 16, 1949, F. K. Sparrow.

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Sparrow, F. K. Phycomycetes recovered from soil samples collected by W. R. Taylor on the Allan Hancock 1939 Expedition. Allan Hancock Pacific Expeditions, Publ. Univ. So. Calif. **3** (6): 301–312, pls. 16, 17. 1940.

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fection spread to other leaves and the aerial ts dried up. The disease was caused by a ecies of *Phytophthora*. Both sporangia and spores were produced on the host plant. The mer developed on stalks emerging through stomata. The oospores were formed in the ues of the leaf-blade and sheath.

All attempts to grow the fungus on the agar dia usually used for cultures of *Phytophthora* led. Infection experiments were conducted the sporangia produced on the host leaves. al lesions were produced on the third day the leaves of *C. bulbosus*.

Fig. 1. Sporangia. 2. Germinating sporangia. 3. Oogonia (antheridia and oospores seen). 4. Germinating oospores.

Phytophthora capsici-*rotundae* Sav.[1] has been reported on *C. rotundus* from Formosa. The fungus under study exhibits affinity to this fungus but differs from it in its inability to infect *C. rotundus* and in the possession of tuberculate oogonia. Furthermore, the antheridia are all paragynous while in *P. capsici*-*rotundae* they are amphigynous or paragynous. On account of these differences, it is described as a new species under the name *P. capsici*-*bulbosi*.

Phytophthora capsici-*bulbosi*, sp. nov.

Maculae irregulares, indefinitae, brunneae. Mycelium amphigenum; hyphae intercellulares, ramosae. Sporangiophori emergentes per stomata, haud ramosi, vel sympodiae ramosi, tenues; sporangia obpyriformia papilla lata, 40 × 25 μ (23-50 × 20-34), germinantia per productionem zoosporarum vel tuborum germinationis; oogonia effermantia in cavitatibus aeries in vagina foliorum, spharica, reticulata, parietibus crassis, fusce brunnea, 40 μ (31-53) diam.; oosporae fere implentes oogonium, spharicae, levibus parietibus ornatae, brunneae 33 μ (25-42) diam.; antheridium ut plurimum unum in singulis oogoniis, paragynum, 16 × 12 μ, hyalinum; oosporae germinantes in maturitate, producentes unum sporangium in apice tubuli germinationis.

On living leaves and leaf-sheath of *Cyperus bulbosus* Vahl. (Cyperaceae). Coimbatore, 10-11-1952. Kumari V. Seethalakshmi.

We are indebted to Dr. H. Santhapau for the Latin translation.

Agric. Col. & Res. Inst., Lawley Road P.O., Coimbatore. December 18, 1952.

V. SEETHALAKSHMI.
T. S. RAMAKRISHNAN.

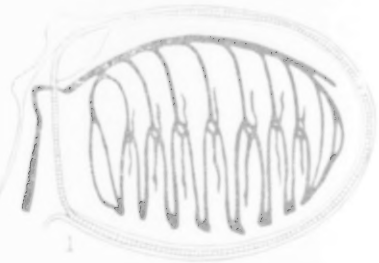
1. Ito, S., in Tokugo, S., *Trans. Nippon Soc. Hist. Sci.*, **14**, 14.

MORPHOLOGY OF THE SPOROCARP IN THE MARSILEACEAE

THE morphological nature of the sporocarp of Marsileaceae has long remained controversial. While it is generally agreed that it is a foliar structure, opinion is sharply divided as to the number, structure and nature of segments entering into its composition. None of the existing views seems to stand a critical examination.

During the course of our study of the anatomy of the sporocarp of *Marsilea minuta* L., though nothing strikingly different from what has already been described could be observed, it was nevertheless realized that in the vascular plan of the sporocarp there are features whose significance has not been fully appreciated so far. A brief account of these may be helpful at this stage.

Each sporocarp receives one median bundle which, towards the distal end, splits up into two branches. From this, about ten commissural bundles are set off alternately on each side (Fig. 1). They encircle down the wall of the sporocarp and break up into three branches each after traversing about one-third of their total distance. The two outer bundles diverge sideways into the inter-sporal area of the wall of the sporocarp. In the lower region each of these fuses with a corresponding branch from the adjoining commissural bundle. The third



It is generally agreed that the primitive leaf of the Marsileaceae had many leaflets, all

(3) the adaxial folding of the pinnules. All these are of special value for a thorough understanding of the morphology of the sporophyll in the Marsileaceæ.

Dept. of Botany, V. PURI.
Meerut College, MAN MOHAN LAL GARG.
Meerut, India,
January 9, 1953.

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INFLUENCE OF DEPTH OF FURROWS IN THE IRRIGATION OF POTATOES

An experiment was conducted to find out under Delhi conditions, the optimum amount of water required to mature the potato crop and give the best economic return of tubers. The treatments were (1) Irrigation : 5, 7 & 9 each of 3" depth. (2) Depth of furrows 4½", 6" and 9". (3) Nitrogenous fertilizers 40, 80 and 120 lb. N/acre. The layout was of 3 × 3 × 3 partially confounded design with two replications having 3 blocks each. Each block had 9 plots and each plot was of 24 × 15', i.e., 1/121 acre in area. 2' border was kept between the plots. Irrigation water was measured with a 90° notch. The rainfall was 4·56" spread over the growing season. There was no run off. The water table fluctuated between 15' and 11' from the surface. The variety of potato was *Phulica*.

Statistical analysis of the results showed that the differences in yield due to treatments of irrigation and depths of furrows were significant at 1% level. In irrigation treatments there was practically no difference in yield with 21" and 27" of water but both were significantly superior to the yield obtained with 15" of water showing thereby that 21" was the optimum dose. The increase in yield due to 6" deep furrows was significantly greater at 1% level over that due to 4½" deep furrow and at 5% level over that due to 9" deep furrows. The 9" deep furrows had given significant increases in yield over that due to 4½" deep furrows at 5% level. The yield of tubers obtained with 80 lb. N/acre was greater than that obtained with 40 or 120 lb. N/acre. 6" deep furrows in combination with 21" of water or 80 lb. N/acre gave the optimum yield.

Ind. Agric. Res. Inst., N. P. DATTA.
New Delhi, B. B. BOSE.
February 16, 1953.

AN UNDESCRIBED SPCEIES OF SYNCHYTRIUM ON *AMPELOCISSUS LATIFOLIA*

On *Ampelocissus latifolia* Planch., a member of the Vitaceæ, a *Synchytrium* species was collected from several places in Bihar, which on examination was found to be undescribed. On the leaves the infection appeared as tiny yellowish minute galls, which often were grouped together in close proximity and presented a scabby appearance. On stems the galls were minute and imparted a warty appearance to the infected regions.

Sections through the galls on leaves and stems indicated the presence of resting spores only and the prosorus and sporangia were absent. The galls were single with a large reddish-brown resting spore in each. The epidermal host cells surrounding the infected epidermal cell multiplied rapidly and produced a mass of hyperplastic tissue which surrounded the gall. Consequently in the sections through the gall, the resting spore was seen embedded in a small mound of hyaline cells. In old galls the resting spores dropped off leaving a large concavity in the centre.

Comparative studies indicated that it differs from other species of *Synchytrium* known on Vitaceæ and related families.

Synchytrium ampelocissi Mishra sp. nov.

Inciting gall formation on leaves and stems; galls minute, golden yellow, often grouped together and presenting a scabby appearance, simple and distinct. Resting spores globoid to subspherical, golden-brown, thick-walled with oil globules surrounded by a mound of thin-walled tissue, 2 to 3 layers at top and 2 to 4 layers on the sides, measuring 110·4 to 220·8 μ average 141·4 μ in diameter.

Hab. On leaves and stems of *Ampelocissus latifolia* Planch., Darbhanga, Bihar, 7-12-1952, leg. J. N. Mishra. Type deposited in *Herb. Crypt. Ind. Orient.*, New Delhi.

Grateful thanks are due to Dr. M. J. Thirumalachar for his kind help in identification of the fungus and preparation of the manuscript.

Div. of Plant Pathology and Mycology, J. N. MISHRA.
Bihar Agric. Res. Inst., Sabour, Bhagalpur,
February 13, 1953.

EGG-YOLK FACTOR AS BUFFALO SEMEN DILUTOR

It has been shown that the fertilizing capacity or the motility of buffalo spermatozoa cannot

be retained on an average for more than 48-72 hours in either egg-yolk phosphate or citrate buffer dilutors, which have proved so useful and popular for *Bos taurus* and *Bos indicus* semen. This has been a limiting factor in the wider application of artificial insemination in buffalo.

Experiments recently started with the active principle present in egg-yolk have given encouraging results. The active principle was isolated by first precipitating proteins in egg-yolk with the addition of 4 vols. of acetone and subsequent washing with acetone to remove the greater proportions of the lipids. The yellowish precipitate was dried in vacuo to remove acetone, then extracted with Sorensen's buffer system—$Na_2HPO_4 + KH_2PO_4$ (pH 7.4) and followed by filtration or centrifuging of the buffer extract to remove insoluble material.

Fifteen good quality ejaculates from eight different buffalo bulls, belonging to a breed indigenous to Uttar Pradesh, were preserved at 4° C. in the solution of the active principle in the ratio of 1 : 1. Samples taken from the same ejaculates and kept in egg-yolk phosphate buffer dilutors served as controls. In the majority of cases, two samples of each ejaculate were preserved in each dilutor. In the controls no sperm survived beyond 12 days while in the samples preserved in the active principle live sperm were present upto 21 days. Further, in the former, out of 14 ejaculates, 5 could not be used for artificial insemination after 24 hours, 8 after 96 hours and 1 after 144 hours (having motility rating less than + + +); while in the latter, 5 could be used upto 192 hours, 1 upto 240 hours, 5 upto 288 hours and 1 upto 336 hours. Only in two samples kept in the active principle was no live sperm present after 96 hours. It was also observed that the trace of lipo-protein was essential to prevent spermatozoa from the temperature shocks[2]. These results show that the life of the buffalo sperm *in vitro* could be extended for periods upto 2 to 3 times through the use of only the active principle in egg-yolk instead of egg-yolk itself in the dilutor. Further work is in progress.

Division of Animal Genetics, Indian Veterinary Res. Inst., Izatnagar,
March 10, 1953

P. N. SRIVASTAVA.
S. S. PRABHU.
P. BHATTACHARYA.

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'CREEPING' A MUTANT IN *CAJANUS CAJAN* MILLSP.

During the course of botanical improvement work on tur at the Agricultural Research Station, Niphad (Nasik), two unusual plants having abnormal structure and distinctly different as compared to the normal tur plants, were observed in the F-3 progeny of a cross between T. 74 and T. 43. These plants arose spontaneously and are breeding true for the last six years.

The normal tur plants grow erect, giving lateral, erect branching of indefinite or racemose type. None of the branches in normal tur plants is prostrate.

Newly observed plants have a weak stem as well as branches and hence put forth all the lateral branches close to the ground, which results in a prostrate habit of growth. Because of the peculiar growth habit correlated with this character, they have been named *Creeping*.

The creeping character had not been observed in either of the parental lines. Creeping plants are indistinguishable from the normal plants up to the time that the stem begins to elongate rapidly. Under ordinary field conditions these plants are about 1½' in height and 1½ to 2 months age at this time. As the stem and branches elongate, they lack sufficient strength to hold the plant erect and branches spread flat on the ground.

The prostrate habit is likely to be found useful as a cover crop and would help in soil conservation in the dry regions and in strip cropping.

The detailed genetical behaviour of these plants are under study and will be published later. Histology of stem of these plants is also being studied.

Agricultural Res. Station, Niphad (Nasik).

B. B. CHAUDHARI.
J. A. PATIL.

February 11, 1953

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Habitat in partibus herbaceis, plerumque foliis, plantarum plurimarum, praecipue *Vaccinii Myrtilli* L., in Alpibus Pedemontii (Italia sept.), nec non in Germania, Polonia, Rossia, Fennia, Suecia.

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RÉSUMÉ

L'auteur signale la découverte et donne une brève description de la forme parfaite de *Valdensia heterodoxa* Peyronel. C'est un Discomycète inoperculé de la famille des *Sclerotiniaceae*, dont les apothécies ont été observées plusieurs fois en nature et aussi obtenues en laboratoire sur des feuilles marcescentes de *Vaccinium Myrtillus* L. ayant subi l'action des basses températures hivernales. Ces apothécies naissent de nervures principales noircies et transformées en pseudostromes sclérotiques. Des propagules de *Valdensia* naissent aussi parfois de ces mêmes pseudostromes, seuls oubien avec des apothécies. La forme apothéciale constitue un genre nouveau, *Valdensinia*, et une espèce nouvelle, *V. heterodoxa*. Une diagnose latine des phases apothéciale, microconidienne et propagulaire termine la communication.

RIASSUNTO

Viene segnalata la scoperta e data una succinta descrizione della forma perfetta di *Valdensia heterodoxa* Peyronel. Si tratta di un Discomicete inopercolato della famiglia delle *Sclerotiniaceae*, i cui apoteci sono stati ripetutamente osservati in natura ed anche ottenuti in laboratorio su foglie marcescenti di *Vaccinium Myrtillus* L. che avevano subito l'azione delle basse temperature invernali; tali apoteci nascono da nervature principali annerite e trasformate in pseudostromi sclerotici. Propagoli di *Valdensia heterodoxa* nascono talora dagli stessi pseudostromi, ora soli ed ora assieme agli apoteci. La forma apoteciale costituisce un genere ed una specie nuovi, per i quali si propone il nome di *Valdensinia heterodoxa*. Una breve diagnosi delle fasi apoteciale, microconidica e propagolare chiude la comunicazione.

8. **Nectria hakonensis** Y. Kobayashi sp. nov.

Hyphae membranam carnosam vel coriaceam, rugosam et undulatam 1-2 mm crassam compositae, pallide salmoneae, septatae, ramosae, 4-4.5 μ crassae. Perithecia gregaria subimmersa salmonea, globosa, glabra, nitida- 0.2-0.3 mm in diam., ostiolo papillato distincto. Asci cylindrici, apice truncati 80-95×8-9 μ. Ascosporae 1-seriatae ellipsoideae 1-septatae, pallide roseae vel fere hyalinae minutissime verrucosae 11-12×5-6 μ. Sporodochium effusum, centro convexum, margine fimbriatum, deinde pulvinatum, gelatinosum, salmoneum vel aurantium. Conidia (*Fusarium*-typus) cylindrica, plus minusve curvata utrinque attenuata, 5-7 septata, pallide flavescentia 50-70×3-3.5 μ. Chlamydosporae intercalares 2-3-catenatae, cubicae, 5 μ crassae, crassiparietales fere hyalinae.

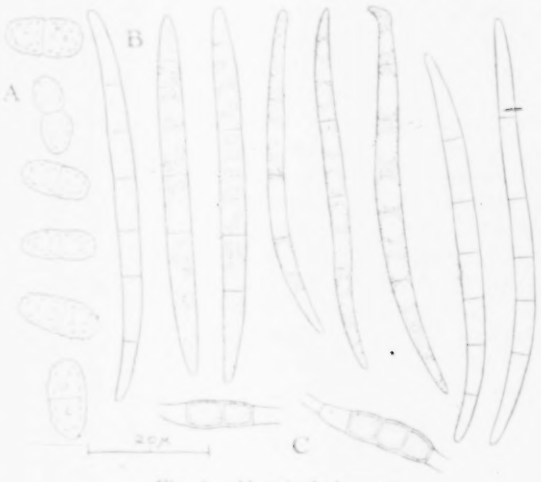

Fig. 9. *Nectria hakonensis*
Ascospores (A), Conidia (B) and chlamydospores (C).

Hyphae composing fleshy or somewhat coriaceous membranes, pale salmon-coloured, septate, branched, 4-4.5 μ thick; hyphal membranes 1-2 mm thick, finely rugose (merulioid) and undulate.

Perithecia gregarious on hyphal membranes, lower half immersed in mycelial mass, salmon-coloured (Light salmon-Orange), globose, with distinct papillate ostiolum, smooth, somewhat glossy, 0.2-0.3 mm in diameter. Asci cylindrical, apex truncate, J (−), 80-95×8-9 μ. Ascospores 1-seriate, ellipsoid, 1-septate, pale rosy or almost hyaline, finely verrucose, 11-12×5-6 μ.

Conidial form-*Fusarium* type. Pionnotes effused, convex at the center, radiately and finely fimbriate at margin, later pulvinate and hairly at surface, gelatinous or mucilaginous, dark salmon-coloured (Flesh Ocher×Apricot Buff), then darker or orange coloured. Conidia large cylindric, slightly curved, tapering at both ends, basal part thicker than the apical part, 5-7 septate, pale yellowish, 50-70×3-3.5 μ. Chlamydospores produced intercalary, 2-3 in chains, cubic, 5 μ

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in diameter, thick-walled, almost hyaline.

Hab. Covering the cut end of trunk of *Pieris japonicum* D. Don, Mt. Kamiyama, Hakone (June 1, 1952).

9. **Fusarium roseum** Link.

Sp. Pl. Fungi II : 105 (1824); Sacc. Syll. Fung. IV : 694 (1886).

Mycelial mass floccose, growth very abundant, later forming sporodochia, pulvinate, very small, 0.5–1 mm in diameter, later confluent, at last effused, gelatinous or slimy, pale salmon-coloured (Pale Salmon Color). Conidia short, sickle-shaped, 25–40×2.5–3.7 μ, pale yellow, commonly 3-septate, rarely 1 or 5 septate. Microconidia and chlamydospores unknown.

Fig. 10. *Fusarium roseum*.

Hab. Isolated from exudation of various trees, near Sima Hot Spring (June 1952).

Pinkish coloration of exudation is mainly due to this mould and secondary to *Monascus purpureus* or *Sporobolomyces* species.

10. **Endomycopsis fibuliger** (Lindner) Dekker Imperfect form.

Growth in malt extract : After 3 days at 25° C, thin, wrinkled pellicle is formed; at last fluffy ring is produced. Sediment is white, fluffy, media becoming turbid. Hyphae remotely septate, 3–3.5 μ in diameter, at septa oppositely branched, branches easily disjoined, long cylindrical or clavate, producing budded cells at end or forming pseudohyphae by successive budding.

Streak culture on malt agar : Growth very slow. Colony firm, dull white or pale ochraceous, raised with white and dense down, or with thick and wrinkled hairs composed of fascicles of hyphae, toward magin finely punctate or rugose. Hyphae slender, 1.7–2.5 μ in diameter, hyaline, thin-walled, almost simple, with remote true septa. Arthrospores formed at the ends hyphae, cylindrical, slightly curved, with rounded ends, 10–40×2–4 μ, granulous. Blastospores (budding yeast cells) originated from arthrospores or primary blastospores, ellipsoidal, 5×3 μ or fusiform or cylindrical, hyaline. Terminal cells are frequently formed at the ends of hyphae, citriform of sphaeroid, 6–7×3–4 μ.

Growth in pure water : After 10 days at 25° C, fluffy hyphae with much conidia produced at bottom. Conidia one of several at tips of hyphae or laterally produced, citriform, 6–7×3–3.5 μ or fusiform, 5–7×2–2.5 μ, hyaline, commonly with one granule, budded like yeast; globose ascus-like cells rarely produced laterally or terminally on hyphae, 5–6 μ in diameter.

Fermentation : Glucose– Galactose– Maltose– Saccharose– Lactose–
Sugar assimilation : Glucose+ Galactose+ Maltose+ Saccharose+ Lactose+
Assimilation of potassium nitrate : Positive.

Hab. Isolated from exudation of *Alnus firma* S. et. Z. var. *multinervia*

Regel, near Sima Hot Spring (June 1951–No. 454, 456).

Except for the non-production of ascus, appearances of slant culture, hyphal structure and arthrospores of the present strain are fairly identical with those of *Endomycopsis fibuliger*.

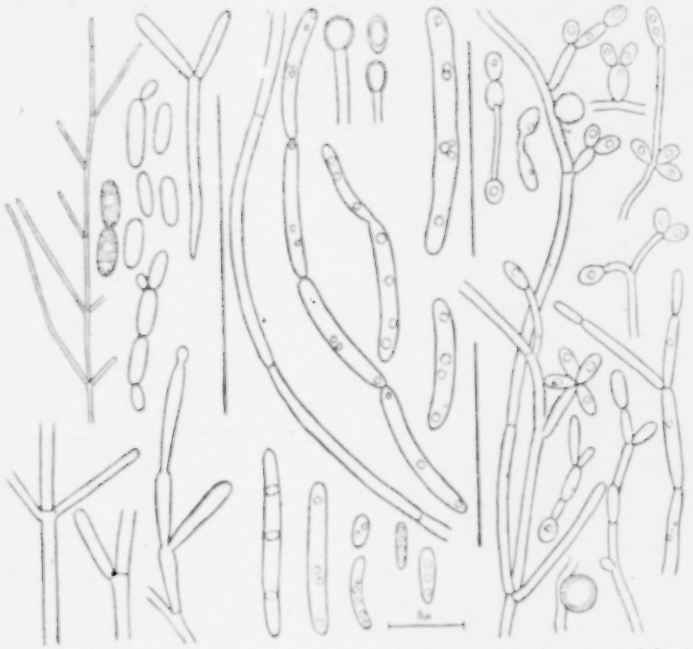

Fig. 11. *Endomycopsis fibuliger* Imperfect form in malt extract (left), in malt agar (middle) and in pure water (right).

11. **Trichosporon merulioides** Y. Kobayashi sp. nov.

In musto maltato, sedimentum pelliculumque formantur, postea membranas myceliales fuciformes lutescentes submersas productur. Cultura in agarico maltato, merulioidea vel lacunosa, mucilaginosa alba farinosa. Hyphae verae hyalinae elongatae 4–6μ crassae, ramosae, multiseptatae. Arthrosporae cylindricae crassiusculiparietales utrinque truncatae vel rotundatae, 9–28×4–6 μ, vacuolatae, facile disarticulatae, atque germinatae. Blastosporae ellipsoideae vel cylindricae 7–10×2.5–3μ. Fermentatio nulla. In medio minerali cum glucoso et galactoso (exigua) crescit. Nitras kalicus non assimilatur.

Growth in malt extract: After 3 days at 25°C, thin pellicle is formed. After 10 days at room temperature (April), thick submerged, yellowish, lobed and fusiform mycelial mass is formed under pellicle. A small quantity of fluffy sediment is seen. After one month, the pellicle has become very thick, filling the tube. Cells of very variable size, commonly cylindrical or ellipsoidal, multi-

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plying by budding and true cell-division, frequently branched, easily disarticulated.

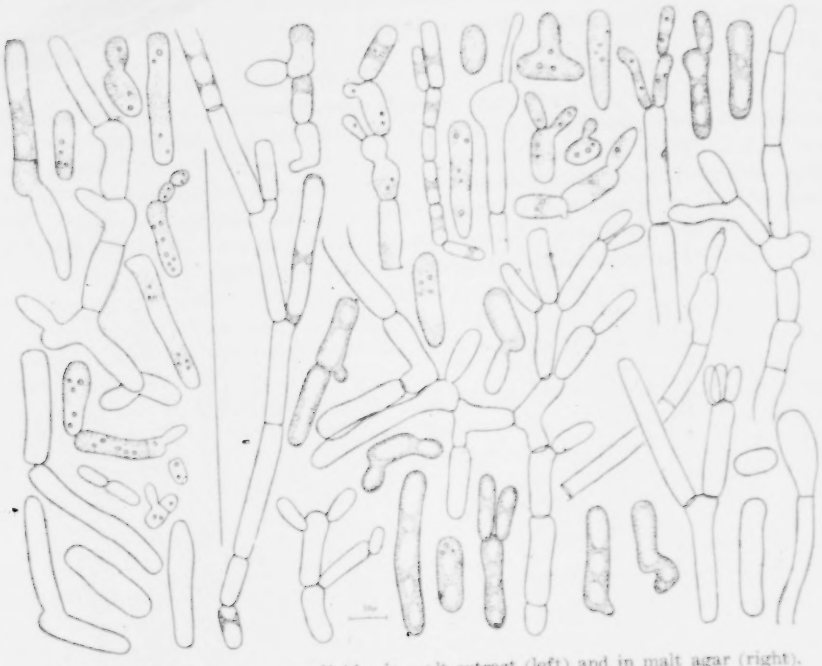

Fig. 12. *Trichosporon merulioides* in malt extract (left) and in malt agar (right).

Streak culture on malt agar: Colony at first raised, punctate, then becoming merulioid or lacunose, soft mucilaginous, white farinaceous, in appearances like *Ceratiomyxa* of Mycetozoa, at last becoming pale cream-coloured, and finely fimbriated. Hyphae hyaline, long, 4–6 μ (commonly 5 μ) thick, monopodially or dichotomously, rarely trichotomously branched, with many true septa. Arthrospores are formed at the upper part of hyphae, easily disarticulated and budded, cylindrical or tapering toward base, rather thick-walled, truncate at both ends or rounded, 9–28×4–6 μ (–8.5 μ), vacuolated, at times with small granules. Budded cells ellipsoidal or cylindrical, at first small, 7–10×2.5–3 μ. Frequently spherical or thick clavate cells are formed at the tip of hyphae. These are not so thick-walled as chlamydospores.

Fermentation: absent.

Sugar assimilation: Glucose+ Galactose+(weak) Saccharose− Maltose− Lactose−

Assimilation of potassium nitrate: Absent.

Hab. Isolated from exudations of stumps of *Kalopanax ricinifolium* Miq. var. *typicum* Nakai, near Sima Hot Spring (June 1951–No. 446, 11).

In some respects, this seems to be near *Trichosporon sericeum* (Stautz) Did-

dens et Lodder, which was also isolated from exudation of oak, but the colony of the latter has flat or slightly punctate surface and the production of true mycelium is very reduced in aerobic condition.

12. **Trichosporon neofermentans** Y. Kobayashi sp. nov.

In musto maltato sedimentum pelliculumque formantur. Cultura in agarico maltato plane expansa deinde exalta, alba, non nitens, levis interdum crispulate vel pilosa. Hyphae 6–11 μ crassae lateraliter ramosae, multissime septatae, vacuolatae aut granulatae, facile germinatae. Arthrosporae cubicae vel cylindricae utrinque truncatae, deinde rotundatae, 9–20×5–10 μ. Blastosporae ellipsoideae vel sphaeroideae granulatae. Fermentatio glucosi et galactosi. In medio minerali cum galactoso et saccharo crescit. Nitras kalicus assimilatur.

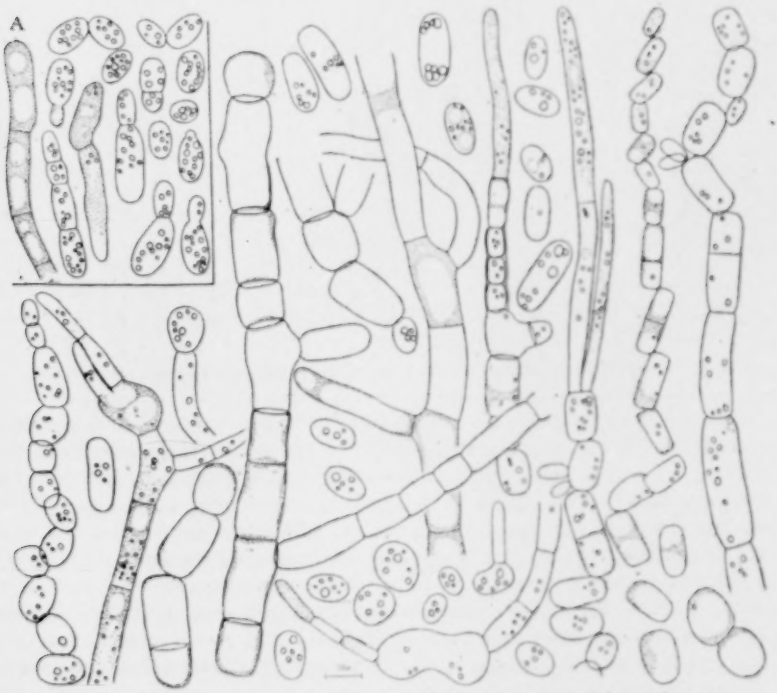

Fig. 13. *Trichosporon neofermentans* in malt extract (A) and in malt agar.

Growth in malt extract: After 3 days at 25°C, thin, dry, dull and fragile pellicle is formed, sediment fluffy, white, media becoming turbid. After 13 days at room temperature (April), pellicle not enlarged, sediments becoming somewhat thicker. Cells commonly large ellipsoidal, budded at one end, with distinct small granules; some celles elongated, cylindrical, multiplying with true septa, vacuolate.

Hanging drop culture: After several days at room temperature (April), true

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mycelium formed, arthrospores distinct, blastospores scant.

Streak culture on malt agar: Colony flat expanded, then elevated, slimy, smooth, dull white, later somewhat wrinkled, finely fimbriate and hairly. Hyphae thick, laterally branched, commonly 6–11 μ in diameter, densely septate, vacuolate or with small granules, frequently budded. Budded cells at first small, ellipsoidal, sphaeroid, granulate. Arthrospores cubic or cylindrical with truncate ends, then rounded, 9–20×5–10 μ. Sometimes single or catenate endospores are formed in hyphae.

Slide culture on potato agar: After 3 days at 25° C, abundant formation of arthrospores and slight formation of true hyphae, but almost no formation of blastospores.

Fermentation: Glucose+ Galactose+ Maltose− Saccharose− Lactose−

Sugar assimilation: Glucose+ Galactose+ Saccharose+ Maltose− Lactose−

Assimilation of potassium nitrate: Positive.

Hab. Isolated from exudation of some broad-leaved tree, near Sima Hot Spring (June 1952–No. 4).

Trichosporon fermentans Diddens et Lodder resembles to the present species in some respects, differing, however, in the abundant formation of blastospores in slide culture and non assimilation of potassium nitrate.

樹幹の流出液という特殊な環境下に於ける細菌，原生動物，昆蟲学方面の研究は古くからなされて居り，その数も多い。しかし酵母，黴類に関するものは歴史は古いが，研究の数は思った程多くはない。その最初の分類学的研究は Ludwig (1886) によって発表されたもののようである。彼は独逸の Greiz に於てカシワの一種の樹液中に *Endomyces magnusii* Ludw. を見出し，約2カ年に亘って観察，研究を行った。其後 Brefeld (1891) Holtermann (1898), Rose (1910), Hansen (1911), Nadson 及 Konokotine (1912), Batschinskaia (1914) 等の重要な研究があり，新しくは Couch (1944) のものがある。ロシアは国内に多い白樺類の樹幹流出液より白樺酒を醸造して居った関係上，この方面の研究が積極的に行われた。独逸の Brefeld は *Ascoidea* や *Endomyces* などの著しい研究を行い，Holtermann はジャバに於て *Ascoidea* の他に *Conidiacus* 及び *Oscarbrefeldia* 等の新属を設けた。其の他，熱帯地方のヤシや，樹液ではないがサトウキビ，リウゼツランの液に関するものもある。しかし多くの研究は欧洲に於てなされている。我が国では三好学 (1900) がミヅキの根圧研究の傍ら流出液中の微生物を研究し，斉藤賢道 (1916, 1931, 1932) はヤシ，クヌギ，其の他の樹液中より酵母類を分離している。

従来，研究の対象となった樹種は *Ulmus, Quercus, Fagus, Betula, Carpinus* を主とし，其の他熱帯の Cocos, Ficus 等がある。特にロシアで注目されたのは白樺の樹液である。これらの共通的特徴は，ほとんど落葉濶葉樹で，春先にその樹液の上昇が特に多く，液は弱酸で毒分を含まぬことである。常緑のカシ類は多少微生物に対する有害な物質を含むもののようであり，研究の対象となって居らない。将来研究の対象となりさうなものを挙げるとカヘデ類，ミヅキ，ツタ類，タケ類がある。

針葉樹は樹脂に災され，樹液は少く問題にならない。タケ類は面白いと思うが，タケを伐るのは冬季が主であって，春先のタケノコの延る時期には伐られたものが少いから容易に見出し憎い。濶葉樹種の多い混交林で，炭焼用の伐木地が一番都合のよい研究地

In the present paper, nine species are enumerated, among of them, the genus *Japonochytrium* being new to science, *Rhizophydium japonicum*, *Phlyctochytrium marinum* and *Thraustochytrium globosum* being new species, *Chytridium Lagenaria* var. *japonense* being a new variety, *Catenochytridium Carolinianum* f. *marinum* and *Myzocytium proliferum* f. *marinum* being new formas, *Pontisma* and *Sirolpidium* being new genera to Japan. The writers wishes to express their thanks to Prof. K. Hisauti of the Tôhô University for his guidance and advices.

1. **Rhizophydium japonicum** Y. Kobayasi et Ookubo sp. nov.

Zoosporangia sparsa elongato-ellipsoidea, 12–25μ alta, 5–10μ diam. tenuiparietalia laevia hyalina, maturitate apice uniperforata, inoperculata, basi elongata axim praecipuum rhizoidei constructa; axi praecipuo clavato vel tuberoso 3–10×2–5μ, interdum nullo; rhizoideis brevibus, simplicibus vel ramosis. Zoosporae numerosae globosae aut ellipsoideae 2.5–5μ (plerumque 4μ) in diam., hyalinae, cum globulo refracto. Sporae perdurantes non observatae.

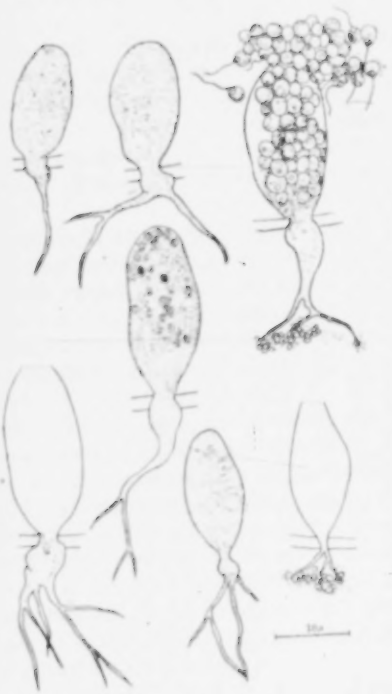

Fig. 1. *Rhizophidium japonicum*

Zoosporangia scattered, elongated ellipsoidal, 12–25μ high, 5–10μ in diameter, thin-walled, smooth, colourless, at maturity broadly perforated at apex. Rhizoidal system composed of main axis and rhizoids; main axis expanded as the prolongation at the base of zoosporangium, clavate or tuberose, 3–10×2–5μ, sometimes destitute. Rhizoids short 1–5 arised from the base of main axis, simple or branched. Zoospores globose or ellipsoid, 2.5–5μ (commonly 4μ) in diameter, hyaline, containing a refractive globule, with a posterior flagellum. Resting spores not observed.

Hab. On *Gracillaria confervoides* (L.) Grev., Kanazawa-hakkei, near Yokohama-City (Feb. 13, 1953-Type in Herb. Nat. Sci. Museum)

Although the fungus was found on *Gracillaria* kept in laboratory in April 4th, the rhizoidal system was obscure interrupted by the contents of host-cell. Accordingly, this was transplanted immediately to a marine species of *Cladophora*, which was found to be parasitized by the fungus in April 15th.

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Some zoospores liberate from the zoosporangial pore with own flagellum one by one, and others make the cyst-like cluster around the pore and then swim away.

This new species resembles to *Rhizophydium messanense* Morini found in *Cladophora* in fresh-water of Italy, but the latter species can be separated by having large zoosporangia (48–54×17–22μ) and pale rose-coloured zoospores.

2. **Phlyctochytrium marinum** Y. Kobayasi et Ookubo sp. nov.

Zoosporangia sparsa, epibiotica sessilia, ellipsoidea vel pyriformia vel globosa, 28–40μ alta, 18–30μ in diam., crassiusculiparietalia, laevia hyalina, foraminibus emittentibus 3–7, nec papillatis, 4–5μ in diam, sine tubo emittente. Apophyses endobioticae, per collum angustum brevem cum zoosporangio conjunctae, subsphaericae vel turbinatae 30–60μ longae 15–20μ in diam., interdum longitudinaliter furcatae. Rhizoidea simplicia apicem attenuata. Zoosporae numerosae, ovoideae circa 4μ in diam., globulo unico refracto et flagello longo posteriore praeditae. Sporae perdurantes non observatae.

Zoosporangia scattered, epibiotic, sessile, ellipsoidal, pyriform or globose, 28–40μ high, 18–30μ in diameter, somewhat thick-walled, smooth, hyaline, with several (3–7) pits, but without discharge tube, pits being 3–5μ in diameter. Apophysis endobiotic, connected with sporangium by narrow and short neck, large, subsphaerical or turbinate, 30–60μ in length, 15–20μ in diameter, somewhat longitudinally furrowed. Rhizoid simple, arising from the base of apophysis, attenuated downwards. Zoospores numerous, ovoid, about 4μ in diameter, with a refractive globule and a long posterior flagellum, swimming away through pits one by one. Resting spores not observed.

Hab. Parasitic on *Cladophora japonica* Yam. in sea-water, Kazusaminato, Tiba Pref. (March 21, 1953- Type in Herb. Nat. Sci. Museum) The fungus was found in April 14th on *Cladophora* cultured in artificial sea-water.

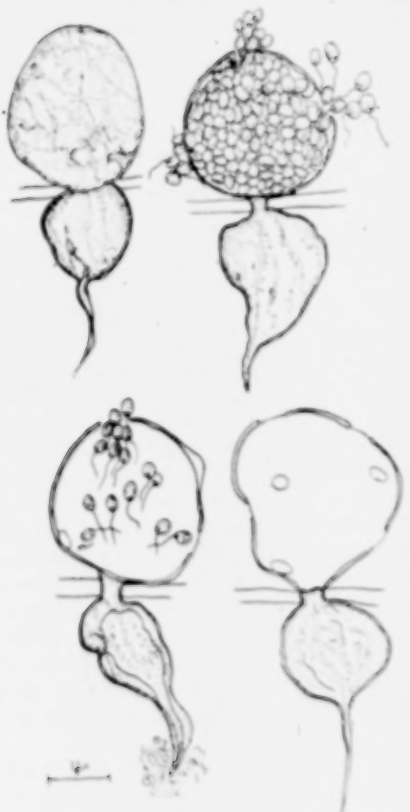

Fig. 2. *Phlyctochytrium marinum*

3. **Chytridium Lagenaria** Schenk

Ueber das Vorkommen contractiler Zellen im Pflanzenreich p. 5 figs. 11–13 (1858); Sparrow, Aquatic Phycomycetes p. 348 fig. 21 L-M (1943). Syn. *Rhizidium Lagenaria* (Schenk) Dang. in Le Botaniste I:64 pl. 3 fig. 23 (1889). *Rhizidium Westii* Massee, Brit. Fung. p. 155 pl. 2 fig. 36, 37 (1891).

var. **japonense** Y. Kobayasi et Ookubo var. nov.

A typo differt zoosporis minoribus breviciliatis et fungis marinis.

Sporangium gregarious on the surface of host cell, sessile, ovoid, globose or pyriform, rather thin-walled, 7–18μ high, 6–15μ in diameter, hyaline, apically with a papilla, apical pore 5μ in diameter, opened by the dehiscence of convex and smooth operculum. Apophysis connected with sporangium by short and narrow neck, napiform or subsphaerical, about the same size with sporangium or smaller, 7–15μ in length, 6–9μ in diameter, hyaline, homogeneous or somewhat granular. Rhizoids rather stout, two or three each originated from the base of apophysis, branched, 2–4μ in diameter at the point of origin.

Zoospores sphaerical or ovoid, hyaline, 2–3μ in diameter, with 2–3 globules, a refracting body and a posterior 10–12μ long flagellum, emerging through a pore one by one and swimming away. Resting spore not observed.

Hab. On *Cladophora japonica* in marine water, Narawa, Tiba Pref. (Dec. 7, 1952-Type in Herb. Nat. Sci. Museum).

Chytridium Lagenaria which was found on fresh water algae of Europe and North America seems to be very near the present marine fungus in form and

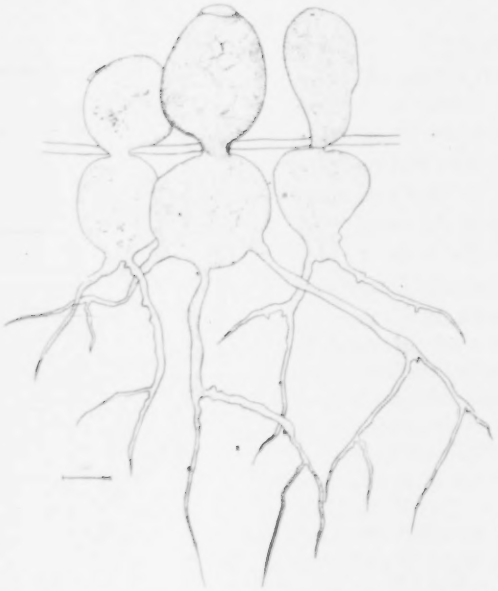

Fig. 3-A. *Chytridium Lagenaria* var. *japonense* Young thallus

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size of sporangium, apophysis and rhizoidal system, but, according to the description of Sparrow, differs in the mode of emergence, large size and long cilia of zoospores.

Fig. 3-B. *Chytridium Lagenaria* var. *japonense* Mature thallus

4. **Catenochytridium Carolinianum** Berdan

in Amer. Journ. Bot. XXVI: 461 fig. 1 (1936); Sparrow, Aquatic Phycomycetes p. 362 (1943).

forma **marinum** Y. Kobayasi et Ookubo form. nov.

A typo differt forma marino et parasitico.

Zoosporangium extramatrical, hyaline, sphaerical, ovoid or kidney-shaped, 40–60μ high, 15–36μ in diameter, somewhat thick-walled (1.5–2μ in thickness), with two or more papillae; orifice circular, 5–10μ in diameter. Apophyses composed of two or three linear series; each series composed of catenulate 2-6 segments, basal segment ovoid or oblong, other segments ovoid, fusoid or irregularly elongate, terminally attenuated. Rhizoids originated from apical and intercalate segments of apophyses, simple or dichotomously branched, not long, length of rhizoidal system (including apophyses) 40–60μ. Zoospores not observed.

Hab. On *Cladophora japonica* Yam. Narawa, Tiba Pref. (Dec. 7, 1952).

The present new form was found on the living green algae in seawater, whereas typical species was reported from United States and Canada on decaying leaves of various grasses in fresh water.

Japonochytrium Y. Kobayasi et Ookubo gen. nov.

Thallus epi-et endobioticus, monocentricus, eucarpicus; zoosporangio epiphytico, laevi, maturitate apice perforato, inoperculato, non proliferato; apophyses

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TWO NEW SPECIES OF FUNGI ON CLOVE TREES IN THE ZANZIBAR PROTECTORATE

By F. J. NUTMAN AND F. M. ROBERTS*

Clove Research Scheme, Zanzibar

(With Plate 13 and 4 Text-figures)

Two species of fungi pathogenic to clove (*Eugenia aromatica*) are described from the Zanzibar Protectorate.

Valsa eugeniae sp.nov. occurs in constant association with clove trees which have died of the Sudden-death disease, and also causes a die-back.

Cryptosporella eugeniae Nutman & Roberts is a severe wound parasite of clove trees of all ages, and often causes the sudden death of young trees.

Two important fungal pathogens have been found associated with clove trees (*Eugenia aromatica*) in the Zanzibar Protectorate. Studies of their pathogenicity are in progress and will be described elsewhere.

Valsa eugeniae Nutman & Roberts, sp.nov.

Conceptacula perithecialia corticem externam occupantia, in primo minuta, orbicularia, truncato-conica, 1 mm. diam., 0·5 mm. alta, nonnihil prominentia, dein saepius secundum rimas peridermii fluendo oblongo-linearia, e matrice confusa plerumque composita, disco omnino carentia, plerumque rostella perithecium exserta oculo inarmata, interne per zonam cinereo-nigram inter se conjuncta. *Perithecia* in conceptaculo singulo orbicularia 4–12 laxe aggregata, in illis linearibus postremo copiosissima, monosticha, globosa vel e latere compressa, laevia, nigra, 200–280 (240) μ diam., in rostellum cylindraceum 600–900 (780) μ longum (in cortice crassiore etiam fere 5 mm. longum), in medio 50–60 (56) μ latum, apice rotundatum, haud incrassatum producta. *Asci* numerosi, sessiles, laxi, subclavati, utrinque rotundati, tenui-tunicati, apice cingulo refractivo nullo praediti, 8-spori, 17–26 (21) μ longi, 4–6 (4·7) μ lati, in maturitate lumen perithecii omnino occupantes. *Paraphyses* nullae. *Ascosporae* minutae, allantoideae, subdistichae vel inordinate conglobatae, etiam in massa hyalinae vel in extremitate cinereae, 4–5 (4·3) μ longae, 1·0–1·5 (1·3) μ latae.

Pycnidia ut saepius in situ observata, superficialia, sparsa, in disco lignoso caeso trunci vel rami sine ordine disposita, nigra, levia, globosa, interdum masi plana, unilocularia, intus hyalina, postremo invaginationibus labyrinthiformibus, conidiophora gerentibus farcta, 200–300 (250) μ diam. in rostellum 250–500 (340) μ longum, in medio 60–90 (74) μ latum attenuata; cum in ramulis humidis *Ulmi*, tamen, cultivata, pycnidia sub peridermio immersa pluriloculata, et per rostellum emergentia. *Conidiophora* teretia, hyalina, ad instar *Dendrophomatis* ramosa 10–42 (19) μ longa, basi 1·0–1·5 (1·3) μ lata. *Conidia* minuta, allantoidea, acrogena, hyalina, 2–4 (3·4) μ longa, 0·5–1·0 (0·8) μ lata, in globulum mellcum denique expulsa. *Hab.* In cortice lignoque *Eugeniae aromaticae* (Myrtaceae) per annum, Zanzibar. *Fungus perithecialis* E. Welsford, 1922 (I.M.I. 14290); A. H. Campbell, Kikangoni Shamba P.T. 30 Nov. 1938 (I.M.I. 44962). *Fungus integer*, J. Nutman et F. M. Roberts, 1951 (I.M.I. 44958 (typus) 44946, 44956, 44957, 44959, 44960, 44961). Obs. Species per perithecia ad instar *Valsae ceratophorae* rostellata, pycnidiaque rostellata, conidiophoris ramosis praedita, et in situ saepius superficialia unilocularia que satis distinguenda.

* Seconded from Rothamsted Experimental Station.

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EXPLANATION OF PLATE 20

Fig. 1. Resting mycelium, chlamydospores and a long narrow microsclerotium developed from a single hypha of *V. tricorpus* on Dox's agar medium. (× 200.)

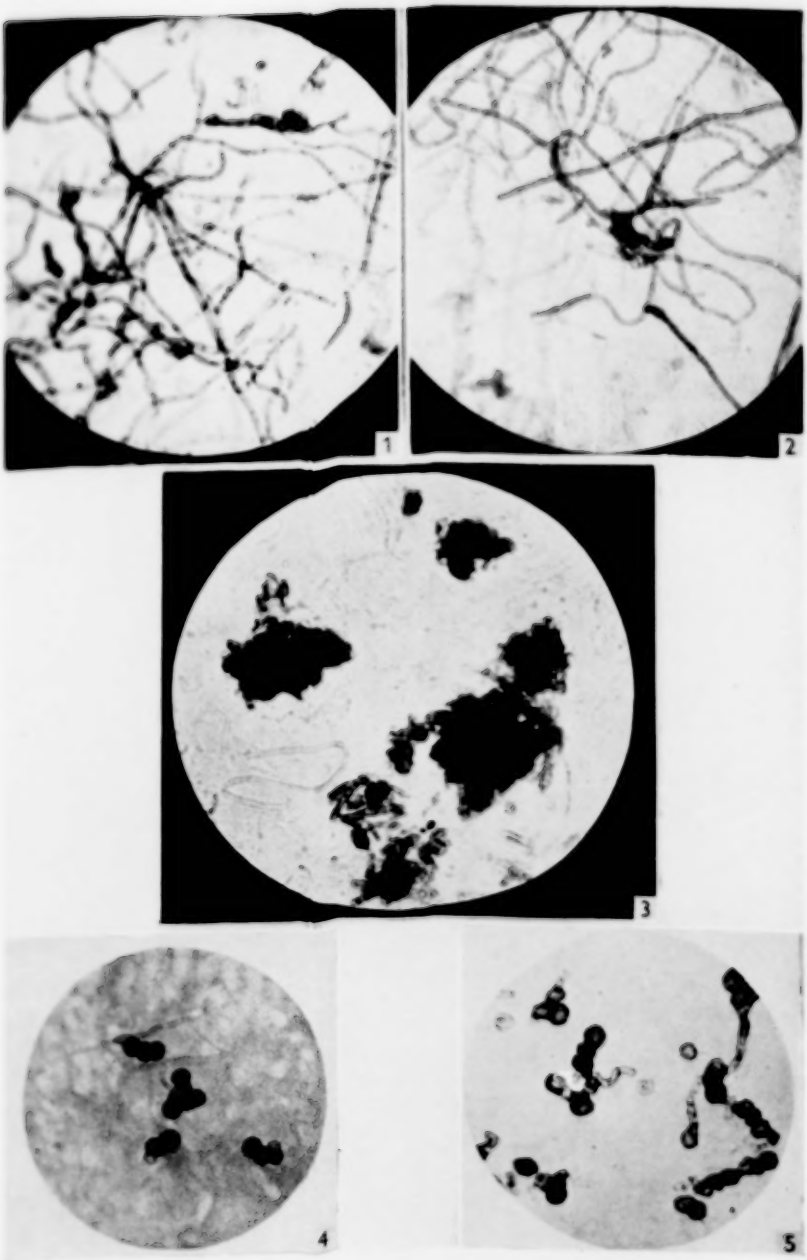
Fig. 2. Resting mycelium and a small microsclerotium developed from a number of hyphae of *V. tricorpus* on Dox's agar medium. (× 200.)

Fig. 3. Typical microsclerotia of *V. tricorpus* on Dox's agar medium. (× 200.)

Fig. 4. Reproduction of microphotograph of chlamydospores of *V. nigrescens* Pethybr. (× 315.)

Fig. 5. Chlamydospores of the *V. nubilum* isolates discussed in this paper from a pure culture on Dox's agar medium. (× 300.)

(*Accepted for publication* 4 *April* 1950)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V. nigrescens (Isaac, 1949), I accepted the principle suggested by Butler (1926) that convenience (usefulness, simplicity and practicability) is the ultimate criterion of classification, and argued that specific rank should be ascribed to these three species. I must therefore refuse to 'lump' the N and T isolates into one group-species. Since the inherent differences between these isolates and each of the three known species are at least as great and fundamental as are their differences from one another, there is, in my view, every justification for according specific status to these two groups of *Verticillium* isolates.

A comparison of the microphotographs of the chlamydospores of Pethybridge's *V. nubilum* (Pl. 10, fig. 4) with those of my N strains (Pl. 10, fig. 5) shows that the resting structures of these organisms are similar. My isolates were pathogenic to Kondine Red tomato and Eclipse potato, whereas *V. nubilum* was originally described by Pethybridge as saprophytic only; but, since there is no record of any tests of his fungus on this variety of potato, and since he did not report any inoculation experiments on tomato, this difference does not appear to be sufficient to warrant a subdivision of his species. It is proposed therefore to ascribe to my N strains the name *Verticillium nubilum* Pethybr.

Since the T strains have not been described previously and since they form the three types of resting structures, I propose to name them *Verticillium tricorpus* sp.nov.

Verticillium tricorpus sp.nov.

Mycelium erectum album septatum; mycelium novissimum prostratum colore croceo; 2–3μ app. crassum cum globulis olei conspicuis. Hyphae fertiles subrectae, verticellate ramosae cum apicali conidiorum globo, hyalinorum et unicellularium, quadratorum vel oviformium, 4·0–10·0 longorum × 2·5–3·5μ crassorum, av. 6·5 × 3·0μ. Mycelium nigrum quiescens, app 6–7μ crassum; microsclerotia av. 80μ diam.; chlamydosporae nigrae, av. 7·5 × 11·0μ. Hab. Lycopersicum esculentum marcescens. Prope Fareham, Hants., Anglia, 1950.

Type material of this new species will be deposited in the Herbarium of the Commonwealth Mycological Institute, Kew; in the Herbarium, Royal Botanic Gardens, Kew; and in the Centraalbureau voor Schimmelcultures, Baarn, Holland.

The fact that each of the other four species is capable of developing one, and only one, type of resting body, while the new species may develop all types simultaneously implies, to my mind, inherent genic differences between all five species; but whether *V. tricorpus* is more primitive and has given rise to the other forms by changes in the genic characters determining the formation of the resting structures, or whether it is a derivative form which has acquired new powers of reproduction during the course of its evolution remains an interesting but at the moment unsolved problem.

My thanks are due to Prof. F. A. Mockeridge for her advice and criticism in preparing the paper, to Mr W. R. Smyth for help in preparing the Latin diagnosis and to Dr R. E. Taylor and the East Malling Research Station for providing me with specimens of the fungi.

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uredosporos con espínulas pequeñísimas, y los teleutosporos, más pequeños, con la membrana "obscure verrucosae" y pedicelo corto y frágil.

He revisado un ejemplar de esta especie, separado del tipo correspondiente a la colección de *Reliquiae Holwayannae* Nº 482, y evidentemente es muy distinta.

De *Puccinia varia* (Diet.) Arthur, (*Amer. Journ. of Bot.* 5 : 487. 1918) la especie tucumana, se aparta por tener sus teleutosporos de mucho mayor tamaño (*Puccinia varia*: 39-45 x 24-29 micrones; P. *ruellicola*: 40-72 x 22-30 micrones).

No encontrando en la bibliografía otra especie con la cual ésta se pueda confundir, creo conveniente describirla como nueva.

PUCCINIA SINGERI, nov. sp. (Fig. 2, c)

Uredosoris epiphyllis, in gregues circularibus dispositis, rotundatis, 0,2-5 mm diam., pulverulentis, nudis, epidermide rupta cinctis, cinnamomeo-brunneis; uredosporis globosis, pyriformibus, vel irregulariter polygonatis, 25-29 x 27-38 micronibus, membrana cinnamomeo-brunea, echinulata, 1,5-2 micronibus cr., poros binis, subaequatorialibus praedita; teleutosoris, praecipue hypophyllis, vel in uredosoris formantibus, minutissimis, nudis, epidermide rupta inconspicua, pulverulentisque, castaneo-brunneis; teleutosporis, lanceolatis, supra acutissimis, vel ellipsoideis,et tunc supra obtusis vel acutis, deorsum attenuatis; etiam irregulariter poligonatis, ad septum constrictis, 18-25 x 54-72 micronibus, membrana pallide aurato-brunnea, levi, 1-1,5 micronibus cr., poro superiore apicale; inferiore ad septum prominentibusque sito; pedicello hyalino, sporam aequante, vel longiore. Statim germinantes.

Hab.: ad foliae vivam *Verbesinae* cujusdam, Tucumán: Sierra San Javier, Parque Aconquija, 24-XI-1950, Cl. Dr. Singer leg., sub. Nº 1033. LPS 19299 ¡Typus!

Es una especie muy distinta a las muchas que se han descripto parasitando a *Heliantheas*, caracterizada por sus teleutosporos con la membrana clara, y delgada, que germinan, sin previo período de reposo.

De *Puccinia verbesina-dentatae* (Syd.) Jackson et Holway, (*Mycologia* 24 : 170. 1932) se aleja, porque sus uredosporos son de mayor tamaño y no tienen la membrana engrosada. He tenido oportunidad de examinar un ejemplar de la citada especie correspondiente a *Rel. Holwayannae*, gracias a la amabilidad del Ing. Burkart, y evidentemente, no tiene punto de contacto con la nuestra.

Me complazco en dedicársela a su colector, mi distinguido amigo el Dr. Rolf Singer, ex micólogo del Instituto Miguel Lillo, de la Universidad de Tucumán.

Instituto de Botánica Spegazzini del Museo de La Plata

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las seis especies que parasitan a *Wedelia*, con ninguna de las cuales coincide la especie puntana. A la que más se aproxima es a *Puccinia subaquila* Jackson et Holway, difiriendo por sus uredosporos de mucho mayor tamaño, con membrana más obscura, de mayor espesor y con espínulas espaciadas; los autores de la citada especie no especifican en la descripción de la misma el tamaño de los teleutosporos y sólo en el comentario dicen que ellos son más cortos y gruesos que los de *Puccinia obrepta* Jackson et Holway; en ese caso coincidirían en tamaño con los de nuestra especie, pero difiere evidentemente por sus uredosporos.

Agradezco al Dr. Angel Cabrera la determinación del huésped.

PUCCINIA RUELLIICOLA, nov. sp. (Fig. 1, b)

Uredosoris hypophyllis, rotundatis, 0,5-1 mm diam., nudis, epidemide rupta cinctis, pulverulentis cinnamomeo-brunneis; uredosporis elipsoideis vel obovoideis, 23-27 x 27-32 micronibus, membrana cinnamomeo brunnea, 2,5-3 micronibus cr., echinulata, poros binis aequatorialibus praedita; teleutosoris hypophyllis, caulibusque, rotundatis vel ellipsoideis, primo tectis dein nudis, bullatis, compactis atro-brunneis, 1-2 mm longis; teleutosporis ellipsoideis vel oblongo-ellipsoideis utrinque rotundatis, ad septum non vel leniter constrictis, 22-30 x 40-72 micronibus, membrana obscure castanneo-brunnea, 3,5-5 micronibus cr., ad apicem crassiore, 5-7 micronibus, levi, vel rarissime verruculosa, poro germinativo: cellula superiore apicale, inferiore ad septum situs; pedicello hyalino sporam duplo vel triplex longiore, persistente.

Hab.: ad foliae ramulibusque, *Ruelliae bahiensis* (Nees) May.: Tucumán, Tapia, in sylvis subxerophyticis, 9-IX-1949, Singer et Digilio, leg. sub. Nº T 630, LPS 18188 ¡Typus!

Esta especie se diferencia de *Puccinia ruelliae* (B. et Br.) Lagerh. su más próxima, por el mayor tamaño de sus teleutosporos, porque el poro germinativo de la célula inferior está junto al tabique y no deprimido, como en la especie vecina, en la cual la membrana de los teleutosporos es generalmente verrucosa, mientras que en ésta es lisa o, a lo sumo, con escasas verrugas. La he comparado con ejemplares de la citada especie, procedentes de Estados Unidos de N. A., México y Cuba.

Henningsen (*Hedwigia* 35 : 235, 1896) cita para la Argentina, *Puccinia paranahiba*, sobre *Ruellia* sp. No he podido ver ningún ejemplar de esta especie, pero ella, según Sydow (*Monogr. Ured.* 1 : 236, 1922) y Jackson (*Mycologia* 24 : 95, 1932), es microcíclica, siendo los teleutosporos de mucho menor tamaño (14-18 x 28-40 micrones), según el primero de los autores, que ha revisado el tipo de esta especie.

Otra entidad con la cual la nuestra podría confundirse, es *Puccinia prevera* Jackson et Holway (*Mycol., loc. cit.*), pero ésta tiene los

Fig. 2. a. **Puccinia puntana**, uredosporos y teleutosporos; b. **Puccinia meyeri**, teleutosporos; c. **Puccinia singeri**, uredosporos y teleutosporos; d. **Uromyces correntinum**, uredosporos y teleutosporos; ¡Todos del tipo!

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brana ornamentada, mientras que en ésta son lisos. Otra (*Puccinia inaudita* Jack. et Holw.) tiene ecidiosporos con la membrana "crasse tuberculata", en cambio los de ésta la tienen "minute verrucosa". y por último, *Puccinia abssica* Jack. et Holw., es una opsis-forma. Además difiere de todas ellas por otros caracteres menos singulares, pero evidentes.

Tiene cierta similitud con *Puccinia verbesinae* Schw., a tal punto que sus ecidiosporos y uredosporos son muy semejantes, no así sus teleutosporos, que son de menor tamaño, sobre todo mucho más cortos (*P. verbesinae*: III-23-29 x 30-42 micrones; *P. Lorentziana*; III-25-27 x 30-34 micrones). Por todas estas razones, considero necesario describir esta especie como nueva, dedicándola a la memoria del eminente botánico alemán Dr. Lorentz, quien tanto contribuyó al progreso de la botánica argentina.

PUCCINIA MELONCILLOI, nov. sp. (Fig. 2, b)

Pycniis non visis, aecidiis hypophyllis, primum secus nervos dispositis, dein tota pagina foliorum occupantibus, 250-300 micronibus diam. cupulatis, pallide flavis, subtiliter laciniatis, cellulis peridialis polygonatis, imbricatis, pariete subtiliter verruculosa, aecidiosporiis ovoideis vel a mutua pressione polygonatis, 16-18 x 20-24 micronibus, membrana leviter spinulescente, hyalina; teleutosoriis antigenis, cau libusque, 0,5-1 mm diam. sparsis, castaneo-brunneis, pulverulentis; teleutosporis elipsoideis, vel oblongo-elipsoideis, leviter curvatis, utrinque rotundatis ad septum non vel leviter constrictis, 18-20 x 28-36 micronibus, membrana cinnamomeo-brunnea, levi vel subtilissime verrucosa, 2-2,5 micronibus, crassa, poro superiore apicale, papilla hyalina humilique instructo, inferiore in medio loculo sito; pedicelo hyalino, brevi, fragile.

Hab.: ad foliae, caulibusque *Solani meloncillo* Parodi, Buenos Aires: Santa Catalina, 16-IV-1950, Fehleisen leg., LPS 18531 ¡Typus!

Como no hallaba en la bibliografía a mi alcance, ninguna especie que coincidiera con ésta, la tomé como especie nueva y se la envié al Dr. George B. Cummins, quien gentilmente me respondió que efectivamente se trata de una especie no descripta aún.

Es una opsis-forma, que se aparta de *Puccinia araucana* Diet. et Neg., por poseer teleutosporos mucho más pequeños y de *Puccinia solanina* Speg, entre otros caracteres, por tener la membrana mucho más delgada.

PUCCINIA PUNTANA, nov. sp. (Fig. 2, a)

Uredosoris hypophyllis, rotundatis, nudis, epidermide rupta cinctis, pulverulentis, cinnamomeo-brunneis; uredosporis globosis, raro ellipsoideis vel obovoideis, 22-27 x 27-34 micronibus, membrana castaneo-brunnea, 3-3,5 micronibus cr. moderate, echinulata, poros 4

aspecto de la membrana. La mayoría de los teleutosporos se hallan en estado de germinación.

Agradezco al Dr. Manuel Barros la determinación del huésped.

PUCCINIA LORENTZIANAE, nov. sp. (Fig. 1, a)

Pycniis non visis; aecidiis hypophyllis, in greges circularibus dispositis, parce prominentibus, cellulis peridialis polygonatis, imbricatis, pariete interiore verrucoso-striato, exteriore levi; aeciosporis globosis, ellipsoideis vel a mutua pressione polygonatis, 15-20 x 18-28 micronibus, membrana hyalina crebre minuteque verrucosa, 1-1,5 micronibus cr.; uredosoris hypophyllis, rotundatis, 0,2-0,5 mm diam., nudis pulverulentis, cinnamomeo-bruneis; uredosporis globosis, ellipsoideis, vel obovoideis, 18-22 x 22-25 micronibus, membrana pallide cinnamomeo-brunnea, 1,5-2 micronibus cr. poros binis aequatorialibus praedita, sparse echinulata; teleutosoris uredosoris,

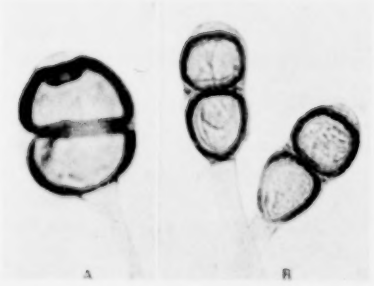

Fig. 1. a, **Puccinia lorentzianae** ¡del tipo!; b, **Puccinia ruelliicola** ¡del tipo!

conformibus sed obscuriore; teleutosporis late ellipsoideis vel globosis, 25-27 x 30-34 micronibus, utrinque rotundatis, ad septum non constrictis, membrana castaneo-brunnea, 2,5-3 micronibus cr., ad apicem paulatim crassiore, 4-5 micronibus, levi, laminata, poro superiore apicale, inferiore ad septum sito, pedicello hyalino, sporam aequante, fragile, saepius lateraliter inserto.

Hab.: ad foliae vivam *Zexmeniae aspilloides* (Gris.) Hass. Córdoba, pr. cerro Las Rosas, 21-XI-1947, I-II-III, Hunziker, leg. sub. Nº 7502, LPS 18705 ¡Typus! — Entre Ríos, Concepción del Uruguay, Quinta de Sagastume, VI-1877, leg.: Lorentz sub. Nº 1039, Hunziker comm., LPS 18706.

Sobre *Zexmenia*, se han descripto varias especies. Tres de ellas (*Puccinia proba* Jacks. et Holw., *Puccinia zexmeniae* Diet. et Holw. y *Puccinia opaca* Diet. et Holw.) tienen sus teleutosporos con la mem-

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UREDO SLEUMERI, nov. sp.

Uredosoris antigenis, rotundatis, vel ellipsoideis, pulvinatis, nudis, epidermide rupta cinctis, 0,5- mm diam., cinnamomeo-brunneis, uredosporis, ellipsoideis, vel obovoideis, 20-22 x 22-28 micronibus, membrana cinnamomea brunnea, 1,5-2 micronibus cr. sparse minuteque spinulosa, poros binis aequatorialibus praedita.

Hab.: ad foliae vivam *Nassauviae darwinii* (Phil.) Reich.; Santa Cruz; E. Calafate, ca. 700 m, leg Sleumer 12051, comm. Singer sub. Nº T 1509, LPS 21705 ¡Typus!

No he hallado en la literatura consultada, ninguna otra especie que tenga las características de ésta, por cuyo motivo la presento como nueva.

No tiene vinculación con *Uromyces nassauviae* Lindquist. Me complazco en dedicársela a su recolector, el Dr. Sleumer, distinguido botánico del Instituto Miguel Lillo, de Tucumán.

El Dr. Angel L. Cabrera tuvo la gentileza de determinar el huésped.

UROMYCES CORRENTINUM, nov. sp. (Fig. 1, d)

Uredosoris hypophyllis, elipticis, 0,5-1 mm longis, nudis, cinnamomeo-brunneis, uredosporis ellipsoideis vel obovoideis, 14-18 x 20-24 micronibus, membrana hyalina, 1,5-2 micronibus crassa, sparse sed conspicue echinulata, poros binis aequatorialibus praedita; teleutosoris hypophyllis, ellipticis, 0,5-1 mm longis, primo epidermide velatis, dein nudis, atro-castaneis, teleutosporis fusoideis vel oblongo-ellipsoideis, utrinque attenuatis, 12-18 x 29-40 micronibus, membrana hyalina levi, 2-2,5 micronibus cr., supra crassiore, 3,5-4 micronibus; pedicello hyalino sporam aequante, persistente.

Hab.: ad foliae vivam *Rhynchosporae tenuis* Link var. *emaciatae* (Nees) C. B. Clarke; Corrientes, Saladas, Santo Domingo, Laguna Grande, 25-IV-1950, Gorretta, leg. sub. Nº 90, LPS 18722 ¡Typus!

Se halla muy parasitada por *Darluca filum*, por cuya causa es difícil apreciar la estructura de los soros, ya que son muy pocos los que están libres del hiperparásito.

Se aparta netamente de *Uromyces rhynchosporae* E.I. et Ev., especie norte y sudamericana.

De *Uromyces antioquiensis* Mayor, se diferencia por sus uredosporos de mucho menor tamaño y sus teleutosporos muy distintos. He podido compararla con un ejemplar de la citada especie, que gentilmente me enviara el Dr. Eugène Mayor, de Neuchâtel, Suiza.

También difiere de *Uromyces obtelanseus* Jackson et Holway, con el cual lo he comparado, por el tamaño mucho menor de sus uredosporos y por sus teleutosporos muy distintos en tamaño, forma y

más pequeños. He aquí las dimensiones de los esporos de las distintas formas ecídicas que se han descripto sobre *Eupatorium*, y que indudablemente están emparentadas:

Aecidium minimum Jack. et Holw.: 12 x 15 micrones.
" *ampliatum*: 23-27 x 27-30 micrones.
" *approximans*: 20-22 x 22-25 micrones.
Puccinia eleocharidis: 16-21 x 18-24 micrones.

Es indudable que se trata de una especie heteroica.

AECIDIUM JATROPHICOLUM, nov. sp.

Pycnis epiphyllis, globosis, paraphysibus carentibus; aecidis hypophyllis, in maculis hypertrophicis insidentibus, et in gregues circularibus dispositis, cupulatis, leniter prominentibus, albis, cellulis peridialis, in sectio visis rectangularis, pariete exteriore laevi, 4-5 micronibus cr., interiore verruculosa, 3-4 micronibus cr., aecidiosporis oblongo-ellipsoideis vel a mutua pressione polygonatis, 16-20 x 22-30 micronibus, membrana hyalina 1.5-2 micronibus cr., verruculosa.

Hab.: ad foliae vivam *Jatropha hieronymii* C. K., Salta, IX-1911 LPS. 13646, Typus!

Las ecidias se hallan agrupados en número de 20, más o menos en manchas hipertrofiadas. No encuentro ninguna otra especie con la cual se la pueda confundir.

Se halla asociada con *Cercospora jatrophicola* Speg.

AECIDIUM TAFIENSIS, nov. sp.

Pycnis epiphyllis, aecidiis contrapositis, globosis, subepidermicis, 80-120 micronibus altis, 100-120 micronibus latis; aecidiis hypophyllis, in gregues circularibus 1 cm., in maculis flavescentibus insidentibus, breviter prominentibus, margine eroso, flavescentibus, 160-200 micronibus diam, cellulis peridialis polygonatis, leniter imbricatis, pariete exteriore 6-8 micronibus cr., levi, interiore 4-6 micronibus cr. transverse striato; aecidiosporiis oblongo-ellipsoideis, globosis vel a mutua pressione polygonatis, 18-24 x 28-30 micronibus, membrana hyalina 1-1.5 micronibus cr. crebre verruculosa.

Hab.: ad foliae *Solani clavatii* R., Tucumán ad viam Tafí del Valle, El Nogalar, 1400 m alt., Cl. Rosa Scolnick, leg.; Dr. Singer, comm., LPS 19370, ¡Typus!; Santa Rosa, 17-XII-1950, Cl. Dr. Singer leg. sub. Nº T. 1097, LPS 19369.

No encuentro ninguna forma ecídica que tenga parecido con esta, y es por ello que la describo como nueva.

Se trata evidentemente de una roya heteroica.

El huesped fue determinado por el Dr. Sleumer, del Instituto Miguel Lillo de la Universidad de Tucumán, atención que agradezco.

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NUEVAS ESPECIES DE UREDINALES

Por Juan Carlos Lindquist

Las nuevas especies de Uredinales, que presento a continuación, son separadas de envíos que gentiles corresponsales me hicieron llegar en distintas oportunidades. A todos ellos, cuyos nombres aparecen al mencionar los colectores, les expreso mi más profundo agradecimiento.

Como siempre, el material queda depositado en el herbario del Instituto y se lo señala en el curso del trabajo, con la sigla LPS.

AECIDIUM APPROXIMANS, nov. sp.

Pycniis epiphyllis, globosis, sub-epidermicis, 100-120 micronibus diam., periphysibus brevis, aecidiis hypophyllis, in greges circularibus in maculis necrosatis dispositis, cupulatis, margine lacerato, 180-200 micronibus diam. cellulis peridialibus firme conjunctis, rectangularis 20-22 x 12-14 micronibus, pariete exteriore levi, interiore verruculoso; aecidioporis globosis, vel a mutua pressione polygonatis, 20-22 x 22-25 micronibus, membrana hyalina 1-5 micronibus crebre minuteque spinulosae.

Hab.: ad foliae vivam *Eupatorii clematidei* in alneto montano, 2400 m propre Tafí del Valle, prov. Tucumán, 31-XII-1950, cl. Dr. R. Singer, sub Nº T 1095, leg.; LPS 19367, Typus!

Esta forma ecídica se parece a la de *Puccinia eleocharidis*, con la cual la he comparado, utilizando a tal fin un ejemplar parasitando a *Eupatorium purpureum*, procedente de los Estados Unidos de Norte América (ex-Herb. Arthur-48069), pero difiere porque las células del peridio tienen distinta forma y tamaño, y porque mientras la membrana de las citadas células en la especie norteamericana es "fuertemente verrucosa", en la argentina es "finamente verrucosa".

Aecidium ampliatum Jackson et Holway (*Mycol.* 10:148, 1918) tiene los esporos de mucho mayor tamaño, mientras que *Aecidium minimum* Jackson et Holway (*Mycol* 24:121, 1932), tiene esporos mu-

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quement celle reconnue par WHETZEL pour caractériser les *Botryotinia*. En effet nous avons constamment trouvé une texture fibreuse dans la portion médullaire, celle-ci pouvant devenir alvéolée tandis que le cortex demeure élastique. Il n'y a pas de matrice gélatineuse.

3° Dans les apothécies, obtenues en culture pure à partir du stade *Botrytis*, on observe des paraphyses filiformes à leur base, puis renflées en masse à leur sommet ou légèrement claviformes. Elles ne sont pas ramifiées.

Il convient cependant de reconnaître que les longs travaux de WHETZEL apportent une heureuse tendance à la simplification de l'étude d'un groupe jusqu'alors très complexe. La caractérisation générique se fait jour. C'est pourquoi, contrairement à l'opinion formulée récemment par Mary NOBLE (*l. c.*), qui n'admet pas la classification proposée par WHETZEL, nous croyons utile de décrire le stade parfait de *Botrytis squamosa* comme *Botryotinia squamosa* SP. NOV. avec la diagnose suivante :

Apothecia brunneo flavescentia, post siccationem fusca, e sclerotiis singula oriunda, discoidea, cyatiformia, tandem applanata, 3.5 mm. *diam. Stipites concolores, crassi, cylindrati*, 2.3 mm *alti ad sursum ampliati.*

Hypothecium cellulis parietate tenui angulatis compositis filamentosa margine cum articulis vesiculosis parietate obscura.

In Thecio, asci ovati cylindrati vel clavati ad basim pediformes, 78.90 × 10.13 µ. *Ascosporae* 8 *monostichae, ovatae vel citriformes hyalinae*, 11.17 × 8.11 µ. *Paraphyses numerosae non ramosae, septatae hyalinae, inflatae*, 3.3. 5 µ *et brunneae ad apicem*, 80.110 µ.

Hab. *in foliis Allii Cepae prope* Rennes (Ille-et-Vilaine). *Status conidicus est Botrytis squamosa* WALKER. *Status microconidicus notus est. Ascosporae statim germinantes.*

IV. — INFECTIONS EXPÉRIMENTALES ET SENSIBILITÉ VARIÉTALE

La souche de *Botrytis squamosa* utilisée pour réaliser quelques infections expérimentales a été obtenue à partir de la variété d'Oignon blanc extra-hâtif de Barletta provenant des environs de Rennes. Le parasite a pu être transmis à la même variété, ainsi qu'à l'Oignon blanc hâtif de Vaugirard, soit par simple application de fragments de culture à la surface de l'épiderme des feuilles, soit par piqûre préalable et introduction de l'inoculum dans les tissus foliaires. Les premiers symptômes de prolifération mycélienne sont perceptibles au bout de 7 jours pour des Oignons conservés à une température de 14°.

L'infection tissulaire se traduit :

a) Par l'apparition de taches petites, blanchâtres, ovales, en relation avec une invasion locale. Au niveau de ces taches on constate soit une

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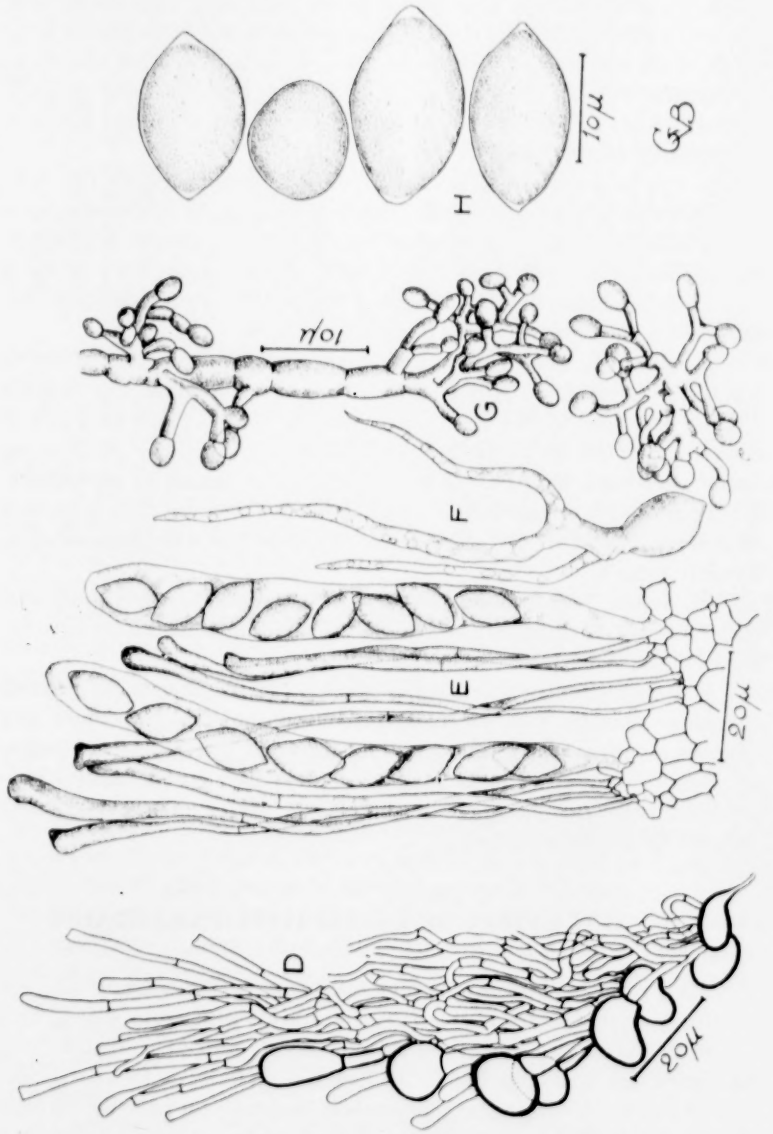

G. 3. — Stades ascosporé et microconidien de *Sclerotinia squamosa* sp. nov obtenus par culture sur milieu Kauffmann dans un délai de deux mois. — D, bord de la pézize composé de filaments entrelacés et d'hyphes bulbiformes à parois épaisses. — E, Asques et paraphyses isolés. — F, Ascospore en voie de germination. — G, filament producteur de microconidies prélevé le long du stipe d'une apothécie. — H, ascospores.

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cates a high degree of success in the previous attempts to eradicate the disease.

The Status of Oak Wilt. FOWLER, MARVIN E. Surveys conducted during 1952 by Federal, State, and other agencies, did not extend the known range of oak wilt beyond the 18 States in which the disease was previously known. However, the disease was found in numerous additional counties. A number of States are conducting surveys and control programs. The best control that can be recommended now is to destroy the oak wilt infected trees to remove them as hazards in the spread of the disease. Diseased trees should be cut and burned or utilized promptly. Before a control program is initiated, consideration should be given to the following: 1) in those areas where oak wilt is well established and infection centers are large, a suppression program would be costly. The oak values in some of these areas are not high and the cost of eradicating diseased trees might be excessive. 2) In the Ozarks and throughout the East the percentage of diseased trees is exceedingly small and oak values are high. The cost of eradicating all the oak-wilted trees would be insignificant in comparison with the value of the residual oak forests.

A Root-knot Nematode Attacking the Crown, Petiole, and Leaf of African Violet. GOLDEN, A. MORGAN. Root-knot nematodes are a major problem in growing African violets (*Saintpaulia ionantha* Wendl.). Control measures that should eliminate root parasitic nematodes have appeared ineffective against root knot in this host. Recent observations have furnished a possible cause for their inefficiency. They have revealed that a root-knot nematode of the *Meloidogyne arenaria* group occurs not only in the roots but also in the crowns, petioles, and leaves of African violets in contrast to most other plants. All developmental stages of the parasite were found in the infected green parts and infection occurred along the vascular tissues. Giant cells were always formed. The crowns and petioles exhibited slight swellings to heavy thickenings, even to distortions in heavily infected crowns. The leaves were thickened in spots, and in instances had blister-like galls, the symptoms increasing with the development of the nematode. Because of the invasion by the root-knot nematode of crowns, petioles, and leaves of this plant, propagation by crown separation and leaf cuttings appears to have perpetuated the infection. It is recommended that only nonnematized plants be used for propagation, or in case of infected plants to use only leaves that are free of infection.

Binomial Classification of the Chrysanthemum Stunt Virus. KELLER, JOHN R. The chrysanthemum stunt virus has been classified according to the Holmes' binomial system in the tobacco mosaic group of the Marmoraceae. The name *Marmor chrysanthemi* has been proposed. This classification is based on the method of transmission and on physical properties of the virus. The virus can be transferred by juice or dodder (*Cuscata gronovii*), but no insect vector is known. The 3–4 month incubation period for stunt virus symptom expression after inoculation can be reduced to 6–8 weeks by keeping the growing point defoliated above the inoculation site for 4 weeks. The virus does not move out of the inoculated leaves in sufficient quantities to establish infection in other parts of the plant in less than 35–45 days after inoculation. The stunt virus was found to have a thermal inactivation point above 96° C. and below 100° C. It is infectious in dilutions up to 10^{-4} and remains infectious at least 2 years in dried tissue. Infectivity is retained for at least 100 days at 3° C. *in vitro* but is lost after 55–60 days at 21° C. The virus withstands freezing *in vitro* for at least 1 year.

A Spot Anthracnose Disease of Bouchea in Cuba. KEVORKIAN, ARTHUR G. A new spot anthracnose or scab disease of a common roadside verbenaceous weed, *Bouchea prismatica* (L.) Kuntz was discovered in Las Villas province in Cuba. The causal organism is *Elsinoe boucheae* n. sp. of the Myriangiales. The lesions are usually prominent on the upper portion of the stem but in severe cases they may occur on the entire stem. The roundish or slightly elongated lesions have raised, well delimited brown to black margins, with either plane or slightly depressed, dirty white centers, measuring 0.5–4.0 × 0.4–2.0 mm. Leaf lesions are practically confined to the lower surface of the midrib and veins and appear as darkish swellings that are raised and sometimes have a colored center, 1.0–3.0 × 0.2–0.5 mm. Ascomata roundish, irregularly scattered on the surface of the lesions, developed on the outer layer of a well developed hyaline prosenchyma, up to 80 μ thick, made up of a hyaline or slightly yellowing pseudoparenchyma, covered with a well differentiated epithecium, composed of 2–4 layers of dark, flattened cells; 80–120 × 30–45 μ. The asci are globose, 16–18 μ in diameter, containing up to 8, triseptate, hyaline ascospores measuring 10–12 × 3–5 μ. Inasmuch as the specific host plant is a roadside weed no control measures were deemed necessary.

Retention of Virulence of Lyophylized Cultures of Pseudomonas caryophylli. MILSTREY, R. A., R. N. STEWART, AND W. F. JEFFERS. *Pseudomonas caryophylli* Burkh. usually loses virulence quickly in culture. Since a virulent organism must be used for artificial inoculations in breeding for resistance to bacterial wilt of carnations, various media and methods of storing were employed in an attempt to retain pathogenicity. These were beef-peptone agar kept under mineral oil, beef-peptone agar frozen at —15°C.; carnation infusion agar under oil and carnation infusion agar frozen; a so-called super agar containing vitamins, peptone, beef extract, dextrose, and carnation extract; and lyophylization. Suspensions of bacteria in beef-peptone broth were prepared from cultures treated as indicated. After inoculation by a 1-minute dip in the bacterial suspension, rooted cuttings were potted and bottom heat applied. After 8 months only the lyophylized culture and the culture on carnation infusion agar under oil caused more plants to become wilted than did the check culture. All other cultures apparently were avirulent or non-viable. Noninoculated plants used as controls often became infected when randomized with inoculated plants. Nevertheless, plants inoculated with the lyophylized culture or the culture maintained under oil on carnation-infusion agar showed a much higher percentage of wilt than control plants.

Experiments With Fungicide-insecticide Dust Mixtures on Outdoor Roses. SMITH, FLOYD F., PHILIP BRIERLEY, AND W. R. JENKINS. Thirty dust mixtures were applied 17 times at weekly intervals in 1952 to 4 replicated plots each containing 5 varieties of roses. Differences between treatments in stem length, number, and weight of flowers produced were greater late in the season than earlier. The fungicides included sulfur 65 or 25 per cent, alone or mixed with ferbam 10 per cent or copper oxysulfate 3.4 per cent; manganese ethylene bisdithiocarbamate (Manzate) 10 per cent; or captan 10 per cent. A miticide—Aramite (88R) 1.5 per cent, p-chlorophenyl p-chlorobenzene sulfure (Ovotran) 1.5 per cent, or malathon 4 per cent—was mixed with each fungicide. The insecticides DDT 5 per cent and lindane 1 per cent were in all mixtures. Of the fungicide dusts applied without miticides Manzate was best, captan or ferbam-sulfur were slightly inferior, and sulfur with or without copper oxysulfate was poorest. Adding Aramite to Manzate resulted in greater flower production but adding malathon gave fewer and smaller flowers. Aramite in ferbam-sulfur mixture gave fewer and smaller flowers whereas malathon gave increases comparable to Aramite-Manzate mixtures. Aramite or malathon used with captan gave higher flower production than malathon-ferbam-sulfur or Aramite-Manzate. All fungicides controlled blackspot but none controlled mildew.

Control of post-harvest brown and rhizopus rots of peaches. SMITH, WILSON L., JR. AND MARK H. HALLER. Sixty materials were tested in post-harvest treatments of hard to firm peaches of several varieties from different growing areas. Inoculation was done by spraying unin-

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Habit.: on dead leaf of *Cocos nucifera* L., Luz, Mylapore, Madras, 6–3–1951, coll. C. V. S., Herb. M.U.B.L. No. 132.

This fungus is easily placed in the Geniculata group. The measurements of the conidia are different from those of any species in this group so far known and I, therefore, consider my fungus as a new species.

I am grateful to Prof. T. S. Sadasivan for critically reading the manuscript and to Prof. H. Santapau for the Latin diagnoses of the two new species.

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and hence shaped like a hammer' or markedly uncinate, the lower and the upper two cells becoming progressively paler, the two apical cells shorter than the two basal cells, the apical cell with a smoothly rounded tip, the basal cell somewhat obconical and with a prominent scar at the base indicating the point of attachment to the conidiophore, $24 \times 12 \cdot 6$ $(20–29 \times 9–15)\mu$.

Only one collection has been seen: on dead culms of *Scirpus* sp., Poonamallee (Chingleput District, Madras State), 24-2-1953, coll. C. V. S., Herb. M.U.B.L. No. 848-I.

This species was first described on *Oryza sativa* L. from Indo-China by Bugnicourt (1950) and my fungus agrees well with the description given by Bugnicourt. Bugnicourt's description indicates the following range in size for the conidia: $18–32 \times 8 \cdot 6–12 \cdot 7\mu$. In my fungus some conidia are up to 15μ broad. The middle cell in my fungus is somewhat verrucose and, although Bugnicourt's description does not indicate any such peculiarity for his fungus, his photograph of the spores of the species suggests a somewhat verrucose middle cell. I have, therefore, placed my fungus in *C. uncinata*.

28. **Curvularia palmarum** Subramanian sp. nov.

Conidiophori brunnei, simplices, erecti, recti vel curvati, septati, $3–5\mu$ lati, variabilis longitudinis. Conidia spiraliter infixa apicibus conidiophororum, fusiformia vel falcata, vel inæqualiter fusiformi-ventricosa, brunnea, 4-septata, cellula media omnium maxima, latissima atque obscurissima, cellulis superioribus atque inferioribus pallidioribus atque angustioribus, cellula apicali lævi atque rotundata ad apicem, cellula basali late rotundata vel obconica, insignita cicatrice distincta, $37 \cdot 6 \times 14 \cdot 2$ $(27–48 \times 11–20)\mu$.

Habitat in foliis emortuis *Cocos nuciferæ* L., Luz, Mylapore, Madras, 6-3-1951, legit C. V. S. (Herb. M.U.B.L. No. 132).

Curvularia palmarum Subramanian sp. nov.

Conidiophores brown, simple, erect, straight or bent, septate, $3–5\mu$ broad, of variable length. Conidia borne in spirals towards tip of the conidiophore, fusiform or falcate or unequally fusiform-ventricose, brown, 4-septate, the middle cell the largest, broadest and darkest, the upper and lower cells paler and narrower, apical cell with smoothly rounded tip, basal cell broadly rounded or obconical with a distinct scar, $37 \cdot 6 \times 14 \cdot 2$ $(27–48 \times 11–20)\mu$.

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cells progressively paler in colour, the two basal cells longer than the two apical ones, apical cell with a smoothly and broadly rounded tip, the basal cell obconical with a scar indicating the point of attachment to the conidiophore, 29·4×13·6 (27–37×11–18) μ.

Only one collection has been seen: on dead leaves of palm (?*Cocos nucifera* L.), Velacheri (near Guindy, Madras), 25-2-1951, coll. C. V. S., Herb. M.U.B.L. No. 104.

This species, originally placed in the Lunata group by Boedijn (1933), has been transferred to the Geniculata group by Groves and Skolko (1945) after a study of the type specimen, and my fungus agrees with the description given by Groves and Skolko.

26. *C. falcata* (Tehon) Boedijn (as *C. flacata*), in *Bull. Jard. bot. Buitenz.*, Ser. III, 1933, **13**: 130; Groves, J. W. and Skolko, A. J., *Canad. J. Res.*, C, 1945, **23**: 99, ic.

Basinym: *Acrothecium falcatum* Tehon (as *A. flacatum*), 1919, in *Bot. Gaz.*, **67**: 509, ic.; Saccardo, *Syll. Fung.*, 1931, **25**: 813; see also Mason, E. W., 1928, *Annotated Account of the Fungi Received at the Imperial Bureau of Mycology*, List II, Fascicle I, p. 5.

Conidiophores brown, simple, unbranched, septate, 3–5 μ broad, variable in length, geniculate towards the tip. Conidia brown, unequally ventricose-fusiform, conspicuously curved, rarely otherwise, 4-septate, the middle cell the broadest and the darkest of all, the lower and the upper cells becoming progressively paler, the apical cell somewhat conical and with a rounded tip, the basal cell obconical and narrowing below to a basal scar indicating the point of attachment to the conidiophore, 25×10·4 (22–29×9–12) μ.

Only one collection has been seen: on dead palm leaf, University Botany Laboratory campus, Madras, 22-2-1951, coll. C. V. S., Herb. M.U.B.L. No. 91-III.

This fungus comes nearest to *C. falcata* amongst the species belonging to the Geniculata group. A re-description of the species based on a study of the type specimen is given by Groves and Skolko (1945) and the conidial measurements given by them are: (22)–24–28–(31)×(10)–12–13–(14) μ.

27. *C. uncinata* Bugnicourt, in *Rev. gén. Bot.*, 1950, **57**: 73 (photographs given).

Conidiophores brown, simple, unbranched, septate, up to 5 μ broad, of variable length. Conidia brown, 4-septate, the middle cell the largest, broadest and darkest of all, conspicuously bent at an angle of 90° or more

Fig. 18. *Curvularia inaequalis* (Shear) Boedijn, from type specimen, IMI. No. 132.